In This Issue—*When to Build a Ramp*

MOTOR AGE

Volume XXXVIII
Number 11

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CHICAGO, SEPTEMBER 9, 1920

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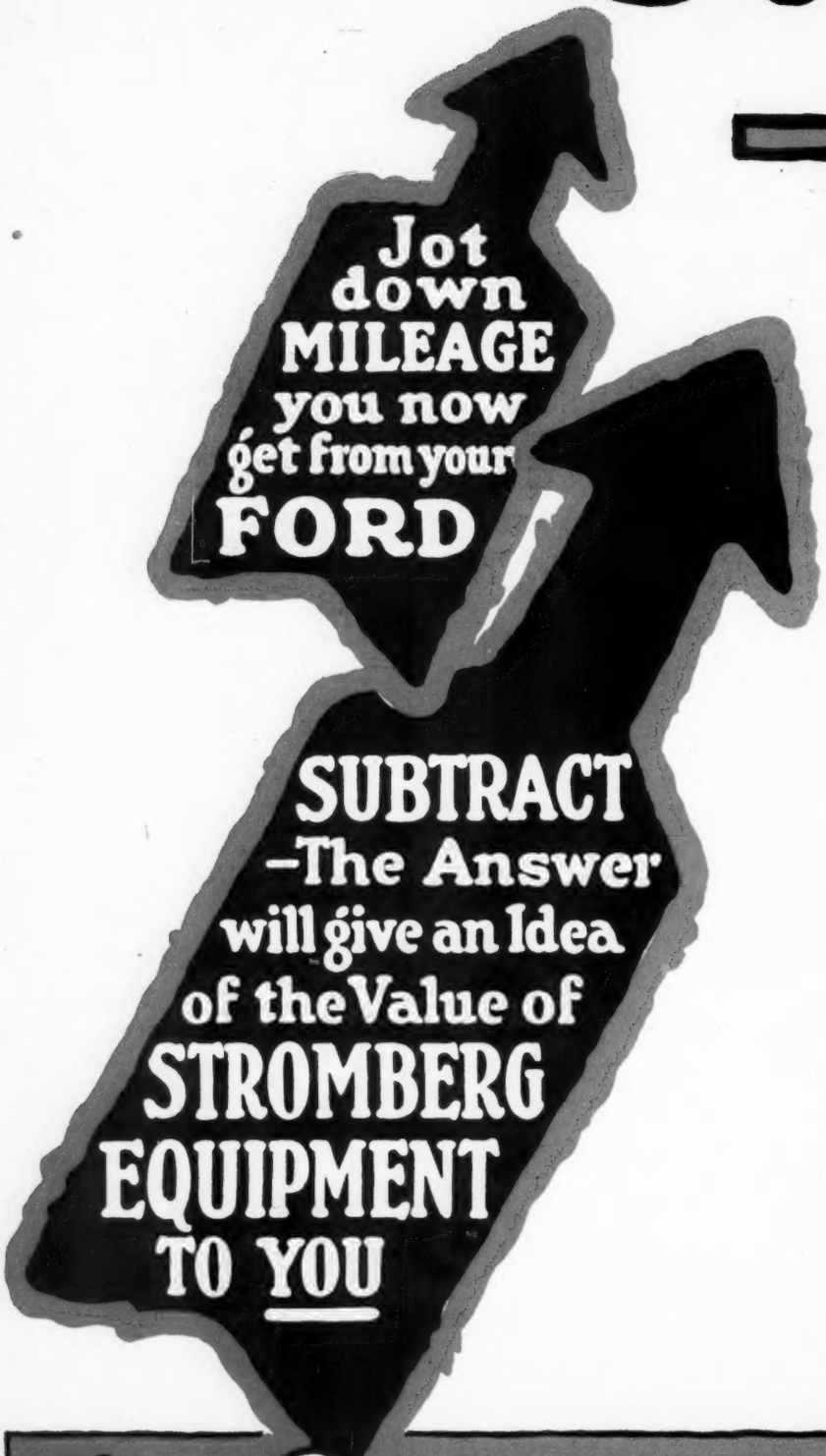
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Vol. XXXVIII Sept. 9, 1920 No. 11

Contents

When is a Ramp Desirable? 7
There are some valuable suggestions in this article to those who contemplate using a ramp in their service station.

Why 183 Cubic Inch Engine Made Good 10
Many do not understand how so small an engine can develop such high power. This article explains the principles of their design.

Views of the Elgin Road Race 12
Some scenes the camera man brought back of this road race classic.

Know How Your Tire Business Stands 13
In which is pointed out the necessity of stricter business methods to make more money.

Where Service Stations and Homes Blend ... 14
How the automotive shop has been made to harmonize with the surrounding residences.

The Orchard Tractor in California 15
What a trained observer has to say about its future and its mechanical requirements.

News Section

Middle West Shows Conservatism 19
N. A. C. C. Opens Season's Activities 20
Governor of Federal Reserve to Address Association 20
California Sees Relief at End of Harvest 21
Dealer Associations Cut Car Thefts 21
Rising Freight Rates Increase Cost of Cars 22
Willys-Overland Takes Over St. Louis Firm 22
Lexingtons Win Pike's Peak Event 23
Traffic Law Not Adopted at Meet 24
Iowa State Fair Has Keen Business Spirit 24
National Tractor Show Space Going Fast 25
Files Suit Against Financing Promoter 26
Oil Production Ahead of Consumption 27
Bright Future for Shale Development 28
Dealers Show Essentiality of Cars 28

Departments

Better Business 34
Autogenous Welding 36
Automotive Architecture 38
The Readers' Clearing House 40
The Accessory Show Case 46
Service Equipment 47
The Automotive Repair Shop 48
Weekly Wiring Chart 49
Gear Ratio Data Sheet 50
Law in Your Business 51
Monthly Truck Specifications Table 52
From the Four Winds 58

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E. E. HAIGHT, Manager
DAVID BEECROFT, Directing Editor
RAY W. SHERMAN, Executive Editor B. M. IKERT, Editor

BRANCH OFFICES
DETROIT, 95 Fort St., W., Phone Maine 1351
CLEVELAND, 536-540 Guardian Bldg., Main 6432
NEW YORK CITY, U. P. C. Bldg., 239 W. 39th St.
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MOTOR AGE

When Is a Ramp Desirable?

Some Facts Of Interest To Those About To Build Or Remodel Their Service Stations

BY TOM WILDER

THE ramp equipped garage is the cafeteria of motor car housing, a strictly self-service proposition. Its greatest value is in this feature. In most cases an elevator could be installed and the rental at reasonable rates on the space saved would much more than pay the operating expense of the elevator. As a good investment, therefore, the ramp should only be used in the building with extensive floor areas, a small proportion of which would be devoted to ramps

If your own individual problem in ramp construction is not solved in this article, write Motor Age, we'll be glad to help you.

THE exclusive sphere of usefulness of the ramp or the place where it is at its maximum usefulness, is the large public garage, especially the downtown city garages where there is a rush to garage cars in the morning and a greater rush in the late afternoon to get them out. Here high land values make multi-storied buildings necessary and ramps are the easiest and quickest means of reaching the upper floors.

They also prove beneficial in the general type of garage where a basement or upper floor is used for public storage and is more or less a separate place, distinct from the service and sales departments. In other words, they are especially adapted to handle a large volume of traffic quickly.

Obviously there are places where the ramp is not the thing from any standpoint, while it has a very decided advantage in others and in its own place is far ahead of an elevator in usefulness.

The small town garageman who builds a ramp to save expense may, without knowing it, pay for an elevator in added labor costs. If his shop is on the second floor, a very desirable location, he must take another car to tow up every ailing car that goes to the shop; this requires the services of two men. He must use a car or truck to haul up every part that is too heavy to be carried by hand. Often his men will spend a half hour tinkering with a car to get it running strong enough to climb the grade on its own power rather than start another car to tow it up. These little items of time mount up into a huge sum at the end of the year and we are confident would go a long way toward paying for an elevator.

The expense of power consumed by an elevator should be negligible as it would not be more and would probably be less than cost of gasoline and oil used by cars in making the climb.

This is where the public garage man has the long end of it; his patrons pay their own power bills and he has no expense whatever for power or elevator attendance or maintenance.

In the large public garages referred to above, where there is heavy traffic up and down the ramps at rush hours, it is best to have either two ramps, one for up use and one for down, or a double affair, up on one side and down on the other side with a dividing rail between.

If the building is several stories high it may be necessary to install a passenger elevator to handle the people on their trips to and from the upper floors.

The ramp is the oldest and in fact natures own method of attaining higher levels. Long before the invention of steps or ladders, back in the hazy mysterious days beyond even the reach of mythology, we can imagine our

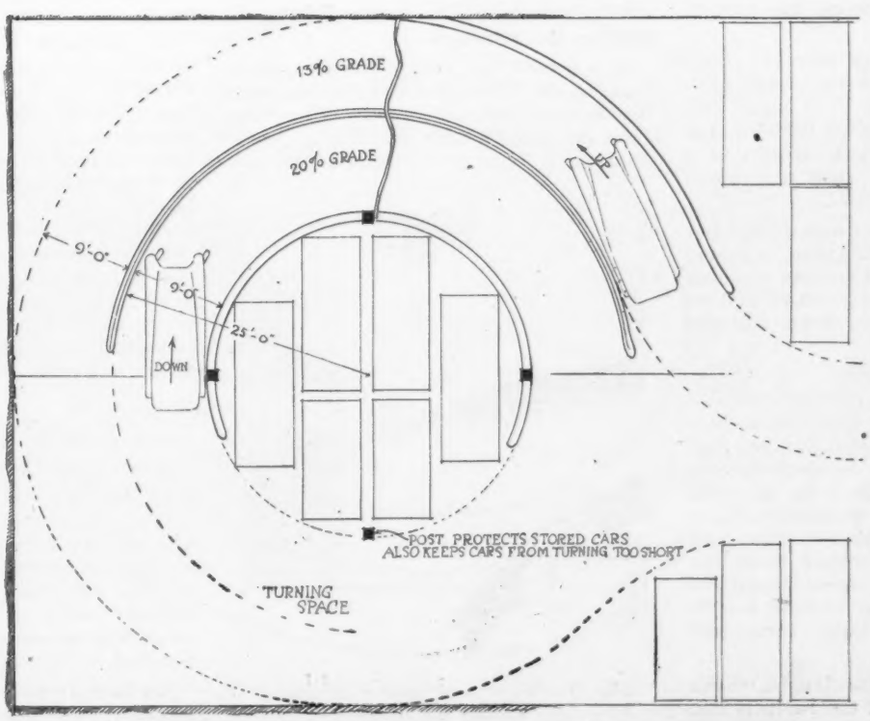

Fig. 1—Example of helicoidal ramp. Outside runway used by ascending cars and inside by descending cars

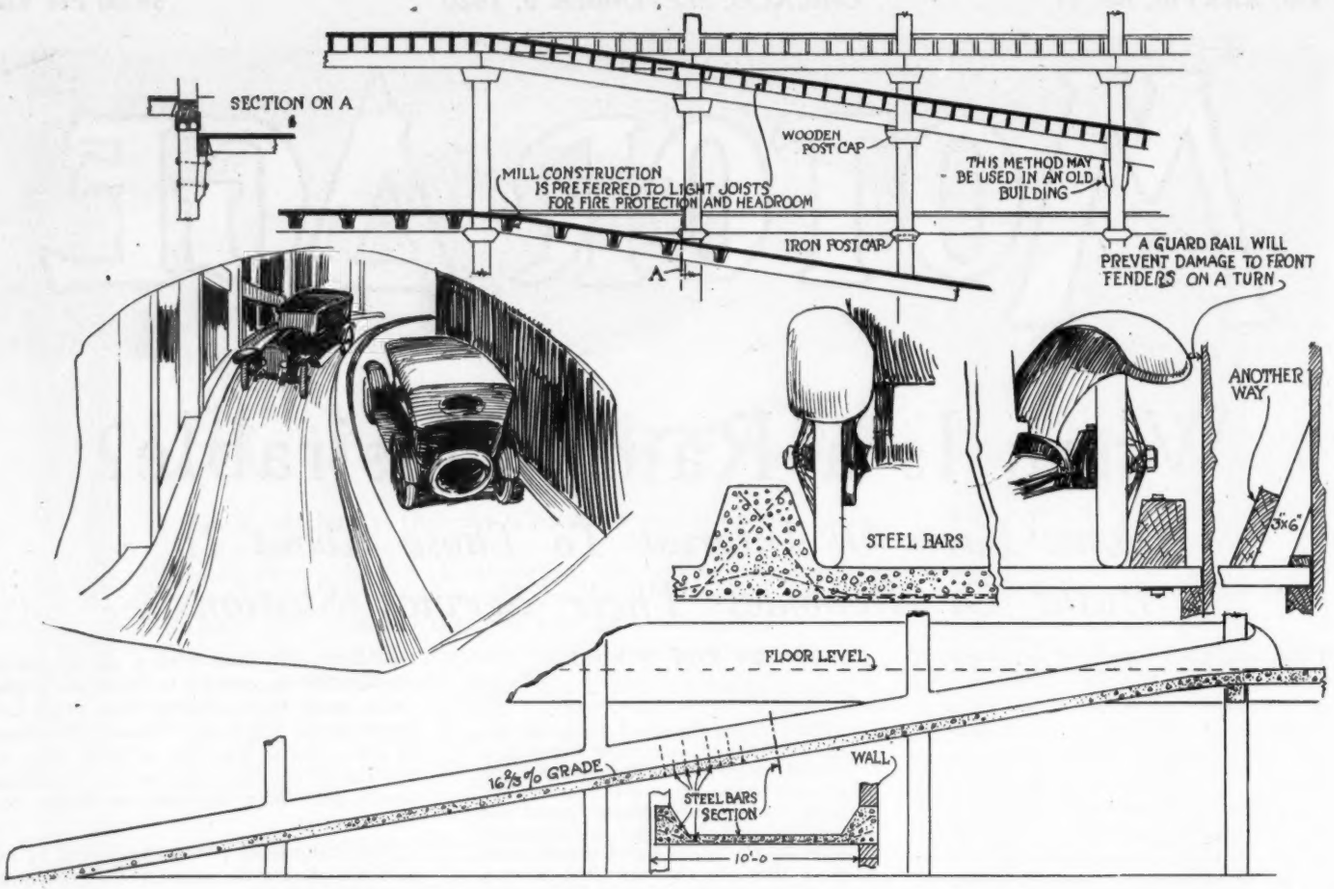
SECTION ON A
WOODEN POST CAP
MILL CONSTRUCTION IS PREFERRED TO LIGHT JOISTS FOR FIRE PROTECTION AND HEADROOM
THIS METHOD MAY BE USED IN AN OLD BUILDING
IRON POST CAP
A
A GUARD RAIL WILL PREVENT DAMAGE TO FRONT FENDERS ON A TURN
ANOTHER WAY
STEEL BARS
FLOOR LEVEL
16 2/3% GRADE
WALL
STEEL BARS SECTION
10'-0

Fig. 2—Some examples of how a ramp can be applied to the service station

stone age ancestors clambering up the mountain side to their cave houses. Later the more or less fabled Tower of Babel some 6500 years ago had an inclined spiral roadway encircling it and extending to vast heights; while still later the pyramids of Egypt possessed inclined passages leading to the internal chambers both above and below the ground level.

Admitting its antiquity, however, since the invention of the stairway ramps have fallen into disuse and it is only with the advent of self propelled vehicles that it has again been brought forward as a useful structure, and now the ramp question is one often asked.

Coming to the ramps themselves, their pitch, location and direction; a great deal if not all depends on the building in which they are to be installed and no definite rules can be laid down, that are infallible.

Straight Ramp Preferable

In a general way, a straight ramp is to be preferred to one that has a turn, an easy grade is better than a steep one, a good approach is to be desired, etc., but all these factors hinge on the form and construction of the building. If there is no place where a straight ramp can be worked in without cutting down the storage space for the whole length of the ramp, then it is better to build it with a turn providing the latter form will cut down waste.

In the same way, if the length of the space at the disposal of the ramp is not great enough to give it the desired grade, it is a question of making it steeper or making a turn with attendant waste of space. Again if the building is less than 60 ft. wide it is next to impossible to build anything but a turning or helicoidal ramp which ascends in a more or less spiral direction entering the aisle above much as it left the one below.

Placing the Entrance

It is a good idea also to place the ramp back in the building instead of entering it directly from the street. There are good reasons for this procedure; pedestrians are liable to be injured by cars coming down and crossing the sidewalk at high speed; on an inside lot frontage space is too valuable to give up to an extra entrance; a ramp entrance presents anything but a pleasing appearance; doors to close an outside ramp entrance are hard to install and operate and make one more worry for the garage man.

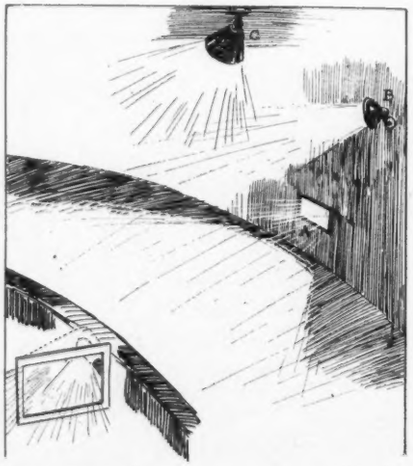

Fig. 3—Ways and means of illuminating the ramp

In positions that are favorable, a double helicoidal ramp such as is illustrated in Fig. 1 is a very good proposition. The outside runway is used by the ascending cars, its grade being much easier than the inside one which is used in decending and is steep in proportion as its radius is reduced. The turning radius of a Packard is 23 ft. 6 in. and some cars greater so that the minimum safe radius to use would be 25 ft. If trucks are to be stored, too, the radius would have to be more liberal. The measurements given on the drawings are about as small as it would be possible to make this job if it is to handle all sized cars, up to and including Packards and it would be advisable to widen the runways slightly if space can be spared.

Must Handle Large Cars

The space in the center can be used to store six cars if arranged as in the diagram or could be used for wash rack, or even left open as a light shaft with skylight above to furnish light for the entire system unless too many floors are involved.

We have dwelt longer than might seem necessary on this diagram because it

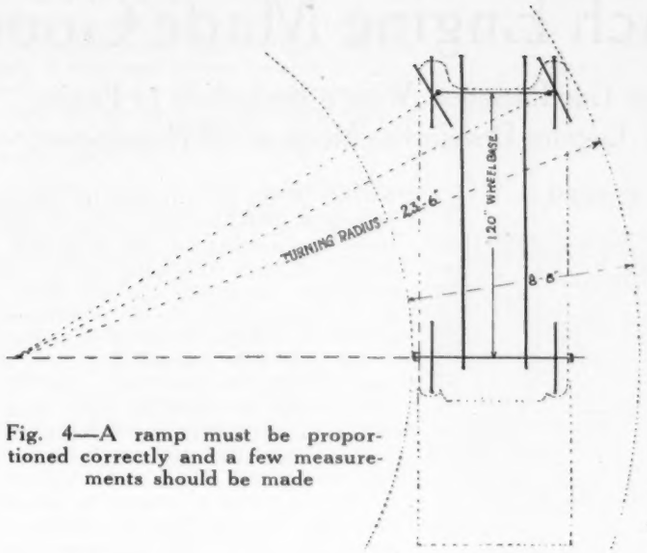

Fig. 4—A ramp must be proportioned correctly and a few measurements should be made

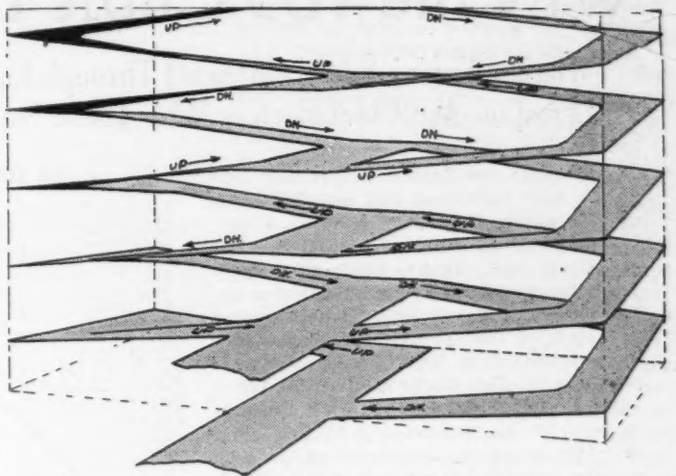

Fig. 6—Perspective view of a ramp layout for a five-story garage

illustrates the principal of the turning radius involved in all ramps that have turns in them or that must be turned into from aisles running at right angles to them at their start.

Find Turning Radius of Cars

It will be seen at once that a ramp must be of a proportion to handle any car that comes in and if there is any doubt about the matter, a few measurements should be made along the line indicated in Fig. 5. The longest cars that can be found are turned in the smallest complete circle possible and the point of the farthest extension, which will be the outside front corner of the front fender, marked on the ground on opposite sides of the circle. Half the distance between these points will constitute the turning radius of the car. In the Nash, it is 19 ft. 6 in. and in the large Packard it is 23 ft. 6 in. There is no rule for finding this radius; it must be determined for each car as it varies with the length of the car and the angle to which the front wheels may be turned.

MANY inquiries are received by MOTOR AGE concerning the best grade suited to a ramp, a hard question to answer. Many times an easily negotiated grade would be too long to work into the available space, while a steeper grade would fit the conditions so well that it would offset the disadvantages of the steeper grade. Where there is plenty of room, a grade of 15 per cent should not be exceeded and 10 per cent to 12½ per cent is better where the public is to use the ramp. Grades as high as 20 per cent are used and occasionally one with a 25 per cent grade is encountered, but these steep grades should be discouraged as dangerous and undesirable.

While measuring the outside radius it is a good plan to measure the inside radius, Fig. 4, as well which is determined by the hub cap of the rear wheel nearest the center of the circle. The difference between these radii determine the minimum width the ramp could be. At least a foot should be allowed on each side or better still allow it all on the outside and make it 3 ft.

Observe Side Movement

Fig. 4 illustrates the principle upon which the turning of a car depends and why it has the sidewise movement; that some car designers do not observe these rules exactly is obvious.

In lighting a ramp artificially it is best to place the lamps so that light will be

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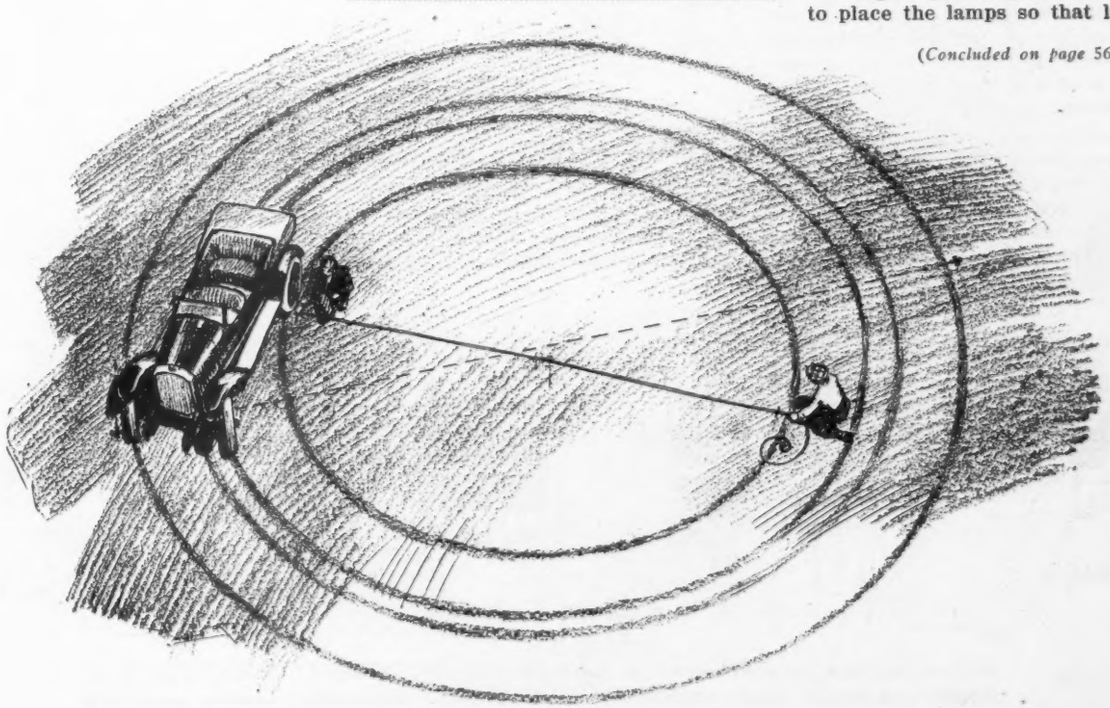


Fig. 5—While measuring the outside radius it is well to measure the inside as determined by the hub cap on the rear wheel nearest the center of the circle

Why the 183 Cubic Inch Engine Made Good

Higher Engine Speed Obtained Through Large Gas Passages, With a Reduction of Engine Friction Are Chief Factors Why These Small Engines Develop as Much as 95 Horsepower

BY ROY E. BERG

NOW that the racing season for 1920 is well nigh over and the 183 cu. in. displacement engine has proven so successful, especially so as demonstrated in the Elgin race, we are confronted daily with the question of why it is that a car having such an extremely small engine will develop the speed it does and attain such tremendous horsepower. In view of the fact that many engines in stock cars having a displacement of approximately 200 cu. in. develop 35 hp. while the 183 cu. in. engine develops over 90 hp. the cause for the inquires is justified.

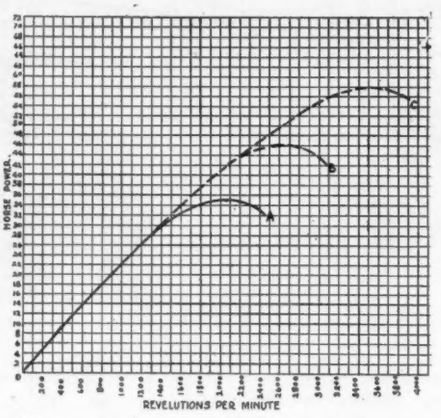
Two important factors answer the question. These are engine speed and a reduction of friction.

To properly consider the factor of engine speed it is well to assume at first that friction within the engine has been entirely eliminated. From this assumption we may consider the question of engine speed without the attendant factors of friction. The simplest way to secure more power from a gas engine is to speed it up.

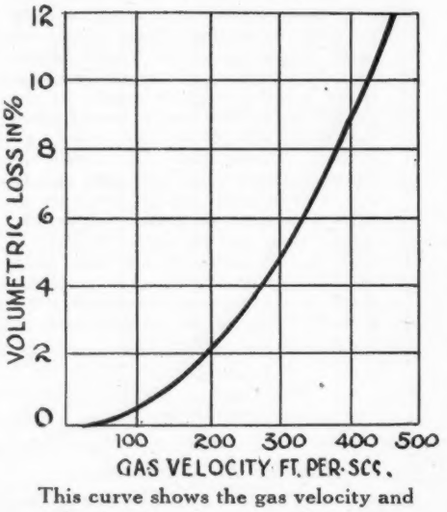
What Makes Power Fall Off?

Herewith we reproduce the horsepower curve from a Dort engine. The solid line is that portion which represents the Dort performance. From the curve it will be seen that at 2000 r.p.m. this engine develops 35 hp. If some means were provided whereby the speed of this engine could be increased to 3500 r.p.m., the curve might appear somewhat as the extended portion in dotted lines shows, from which it can be seen that 58 hp. would be developed. For a small engine of the L-head type the one represented is very good. It has a bore and stroke of 3½ by 5 in. with four cylinders giving a displacement of 192 cu. in.

The question is then what makes the engine horsepower drop off at the point A or what would bring it to the positions B or C? Reference to the curve showing the volumetric loss in per cent according to gas velocity explains this. As



Horsepower curves showing increases of power obtained merely by increasing revolutions per minute



This curve shows the gas velocity and reduction in volumetric efficiency resulting from increased velocity

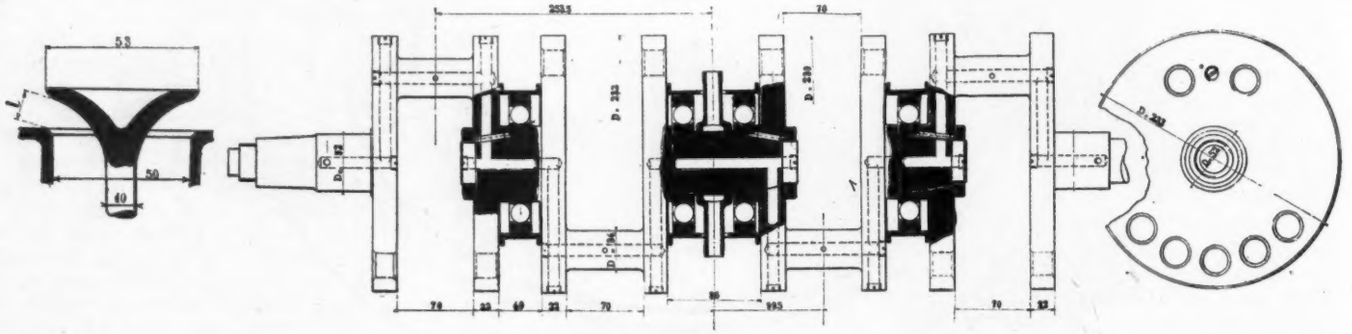
the flow of the gases through the intake manifold becomes higher and higher the friction of the gas through the manifold increases. Consequently a limit is placed upon the amount of gas that will be drawn through the pipe at the high velocities. An engine does not draw into the cylinders equivalent in volumetric proportions to the piston displacement.

The ordinary L-head internal combustion engine as used on the motor car to-day does not draw in more than 60 per cent. Overhead valve engines run higher than this and four valves per cylinder engines still better. Therefore, as the gas velocity through the manifold increased, the volumetric efficiency is decreased. And when the gas velocity through the manifold is increased, the volumetric efficiency is decreased. And when the gas velocity reaches the point of 1500 feet per minute of 250 feet per second, the loss in volumetric efficiency occasioned by the increased friction is so great that the engine power starts in a downward direction. Obviously, therefore, increasing the area of the gas passages and installing more valves is one means which will substantially increase horsepower.

Large Valve Area Sought

The problem of providing enough valve area has long puzzled race engine builders. The general rule seems to be to install as many valves as possible. Above certain limits it is found the best of results are not obtained, for with more than four valves it becomes exceedingly difficult to provide enough water cooling around the stems and valve seats. In stock car practice two valves per cylinder are general.

The Duesenberg race cars which have proven so successful this year, the Monroes and Frontenacs have four, the Ballots four, and the Peugeots which were entered at Indianapolis, but failed to finish the five-hundred-miles, had five valves per cylinder. On a three-valve arrangement two are made intake and one exhaust. A four-valve arrangement which is very common to race car prac-

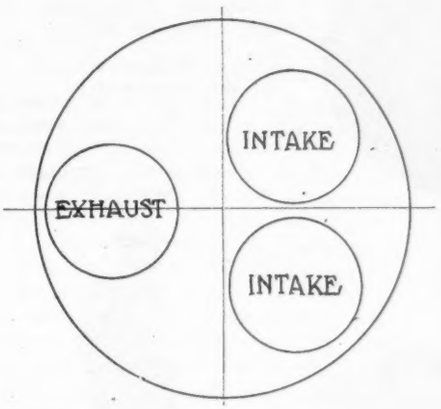


Left—Tulip type valve employed on a noted foreign car. The main thought is to reduce weight and secure ample surface for heat radiation. Right—Ball bearing crankshaft used on Monroe

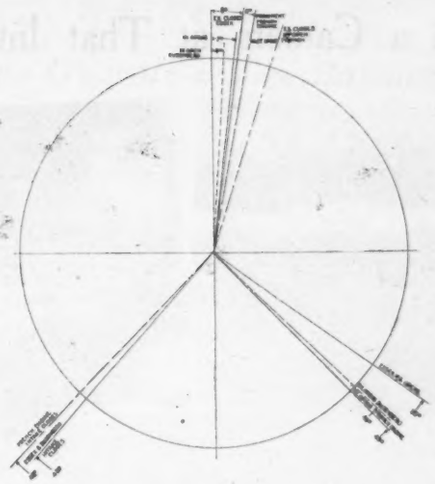
tice is shown in the sectional view of the Monroe engine. A five valve per center is arranged much like the four valve in that it has four valves located in identical positions with the fifth placed directly in the head. The spark plug is then squeezed in directly in the front of the fifth valve.

Further than providing large manifold passages and many valves, more speed ability is secured by making the lift of the valves much higher than is commonly used in stock cars.

All these departures from customary construction help to produce a very fast engine but they also make starting very difficult. Since the gas passages are designed for velocities at terrific engine speeds the gas velocity at cranking speed is so slow as to be almost motionless in comparison. The slow moving air column then has hardly sufficient velocity to sustain the gasoline particles or carry them through to the cylinders.



Cylinder head layout with three valves per cylinder



Timing diagram of three very fast engines

Referring again to the horsepower curve we see that the horsepower has been brought to fifty-eight by merely enlarging the gas passages and installing a sufficient number of valves, say four. The difference between the 58 hp. and the 90 or 95 which would be obtained were the engine designed for racing purposes exclusively has yet to be accounted for. It should be remembered here that the engine started with was a stock proposition and our comparison is somewhat ambiguous. Had this engine had extremely light pistons, full pressure lubrication system, straight gas passages, the results when translated into 3500 r.p.m. speed would have been very much lighter, perhaps as high as 50 per cent. The compression pressure will have a good deal to do with the power. On these racing jobs the compression pressure will run as high as 85 to 90 lbs. per square inch.

Finally another big increase in power is obtained by the proper valve timing. The diagram which is shown herewith gives the valve timing as used on three cars. One is a stock car noted for being particularly fast, and the other two are race cars. Valve timing is a factor that is more important than appears from first consideration. In timing the high speed every effort is made to gain as much from the inertia of the gases as possible. When the piston has reached the lower position on the intake stroke it is powerless to draw in more of the charge.

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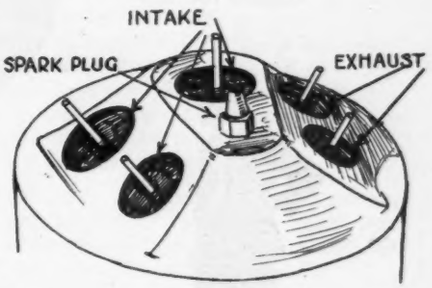
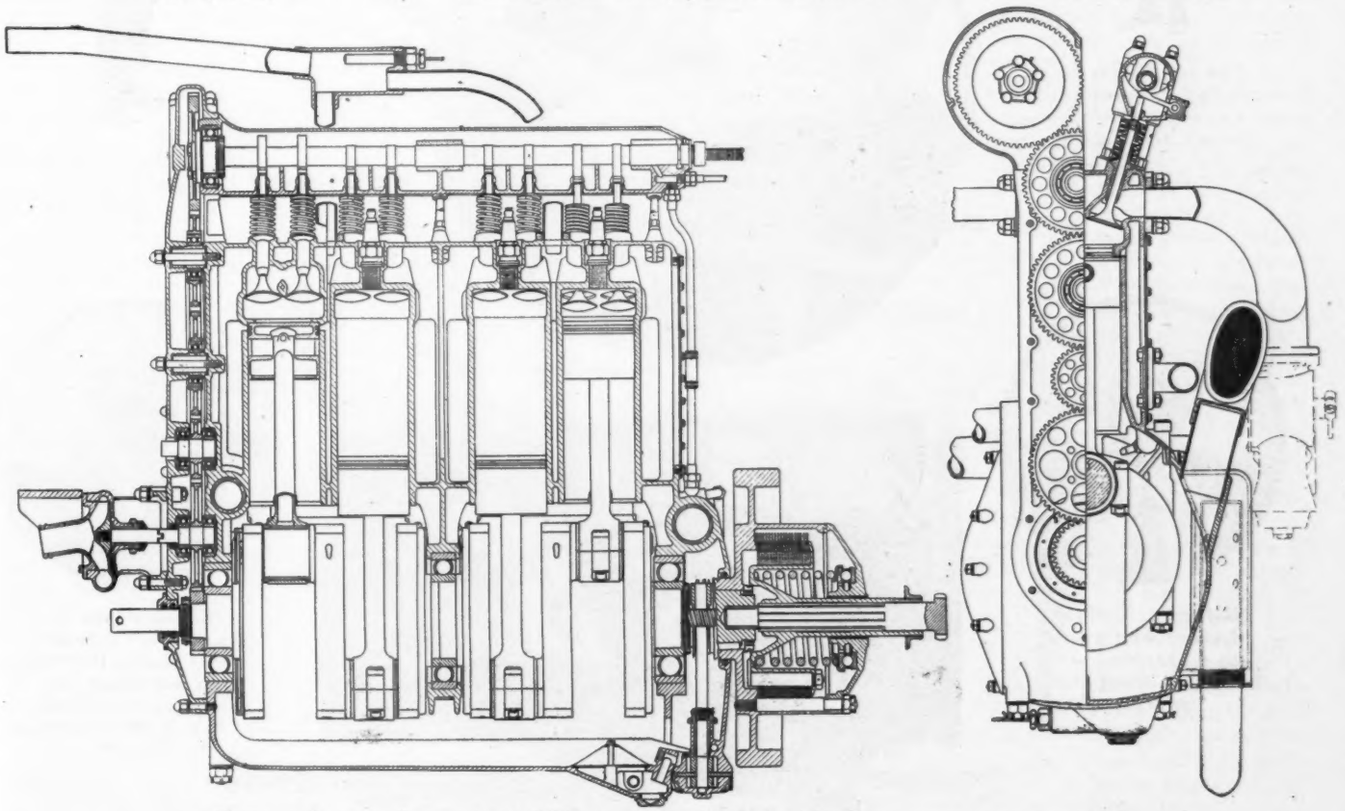
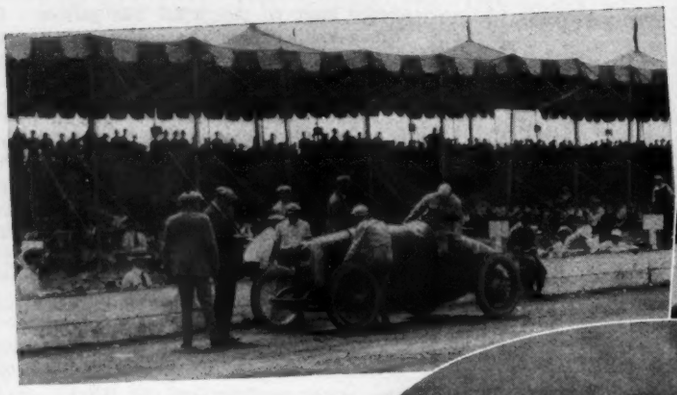


Layout of cylinder with five valves per cylinder. This was used on the latest Peugeot car run in the last Indianapolis race



Front and transverse sections of Monroe engine, a design that has proven very successful. Note the unusually large gas passages

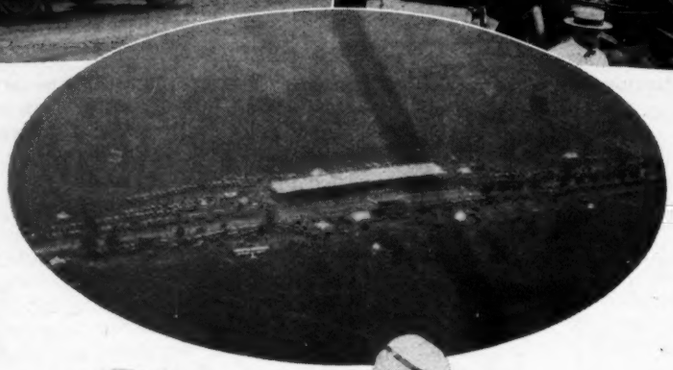
Snooping Around with a Camera at That Interesting Elgin Road Race



The only car to come to the pits during the race. Gaston Chevrolet lost 17 minutes here due to a clogged fuel line

A glimpse of the great downpour of humanity that witnessed the race.

Left, an airplane view of the homestretch



Charles P. Root, A.A.A. representative who directed the race

DePalma and his mechanic making a few inspections just before the start. Note the sight feed oilers under the cowl

President Charles Hayes of the Chicago Motor Club

Referee Clifford Ireland who saw to it that the race was run according to rules

The race was run on Saturday, but this enthusiast drove to Elgin Thursday and camped on a point of vantage in order to get a good look at the race

The race fans do not have to be told who this is but for those not so well informed it is Starter Fred Wagner

If You Operate a Tire Business

KNOW WHERE YOU STAND

Many Dealers of This Country Are Placed in the Class of Uncertain Accounts Because They Neglect Important Business Principles

THE profits of a tire business depend largely on how well the business is organized. There are many tire dealers throughout the country to-day who are buying and selling tires, repairing them, making adjustments, paying their bills, etc., and to all appearances making money. Yet if you asked many of them which of their departments was making money and which was losing it, or how much stock they were carrying at the present time, more than likely the reply would be, "Can't tell you exactly." It is that reply which the tire dealer must change if he is going to survive in business and make any kind of a showing.

HE must know if his new stock is moving, if his vulcanizing department is on an efficient basis, what his place of business is worth in case of a fire and the insurance adjuster asks for a stock record .

Along these lines it is well to observe what The Mason Tire & Rubber Co., Kent, Ohio, has to say regarding the tire dealer's business:

THERE is no law stating how a man must run his business to make it successful, but just as there are customs of etiquette and customs of dress, so there are standards of good business as advocated by the best business interests of the country. They are not written in black and white, such as our laws, but for the man who is ready and willing to keep pace with modern methods of doing business, these standards are an open book and very ready to access by all.

There are many dealers today who through their great interest in their business, which seemingly is thriving, neglect the principles which tend to give them the information concerning their business, which some day they may be called upon to consider, and it is the neglect of carrying out these principles that is placing many of the dealers of this country among the class of uncertain accounts.

When a milliner starts in business, if she is to be successful she will at least once a year visit the wholesale house with which she deals, look over the new styles and get new suggestions that she may be able to go back to her store and produce millinery according to the newest styles and the most modern methods, and thereby assure herself of the fullest business from people in the community in which she is doing business and more profits from her business.

Likewise, at frequent intervals a clothing man and the proprietor of a ladies' apparel store will visit their respective wholesale houses with the idea of getting new ideas of style and bringing them back in order to strengthen their business.

Lack Information of Own Business

It seems very logical, therefore, that the tire dealer should keep pace with the ever changing and ever improving methods of doing business.

The reason for many tire dealers doing business without a knowledge as to whether they are making money, breaking even, or in some instances losing money in their business, seems to be on account of their belated ideas of conducting their business. It is not our purpose to discuss salesmanship. That is a big question in itself, which every dealer must conquer in the first instant before he can realize profits from the tires that he may be selling, for if a dealer cannot sell the tire he is handling, profits are out of the question. But there are many dealers who are handling good tires and selling them but yet their businesses are being operated without knowledge as to where they stand, or without any efficiency or system.

The need of efficiency and system, though important factors in every line of business, are absolutely essential for a truly successful tire business.

As stated before, the methods of doing business are not stipulated by laws, but must be learned by the dealer through close observation of the changes and improvements in business as they are made public by the big business men and magazines of the country for the benefit of all concerned.

It is our belief that no dealer would purposely overlook one means by which he could maintain his business at the highest standard for the biggest profit, but on the other hand, there are many dealers whose time is so taken up with the detail duties involved in their stores, wherever they might be, that they neglect, probably due to their lack of time, to keep informed as they should on the ever onward movement of business.

Efficiency and system are ever changing and improving and it is these two principles that are the lacking units in many of the establishments of the tire dealers throughout the country, which places those dealers in danger of the unexpected.

We do not mean to leave the impres-

(*Concluded on page 57*)

A Perpetual Inventory Card Will Help

STOCK CARD
ARTICLE 33 × 4 Straight Side **MINIMUM** 30

DATE	ORDERED	RECEIVED		COST EACH	SOLD	IN
6-30-20			Inventory			38
7-5-20	40		(Name of company from which tires are bought.)	32 00		
7-5-20		40				78
7/17/20					18	60

Here is a perpetual inventory card which tells the tire dealer immediately how he stands on his new stock for a certain size tire. It shows the number of this size tire he has in stock at all times

Where Service Stations and Homes Blend

Prejudice Against Motor Car Establishments in Residential Districts Can Be Overcome by Making the Design Harmonize with the Surroundings

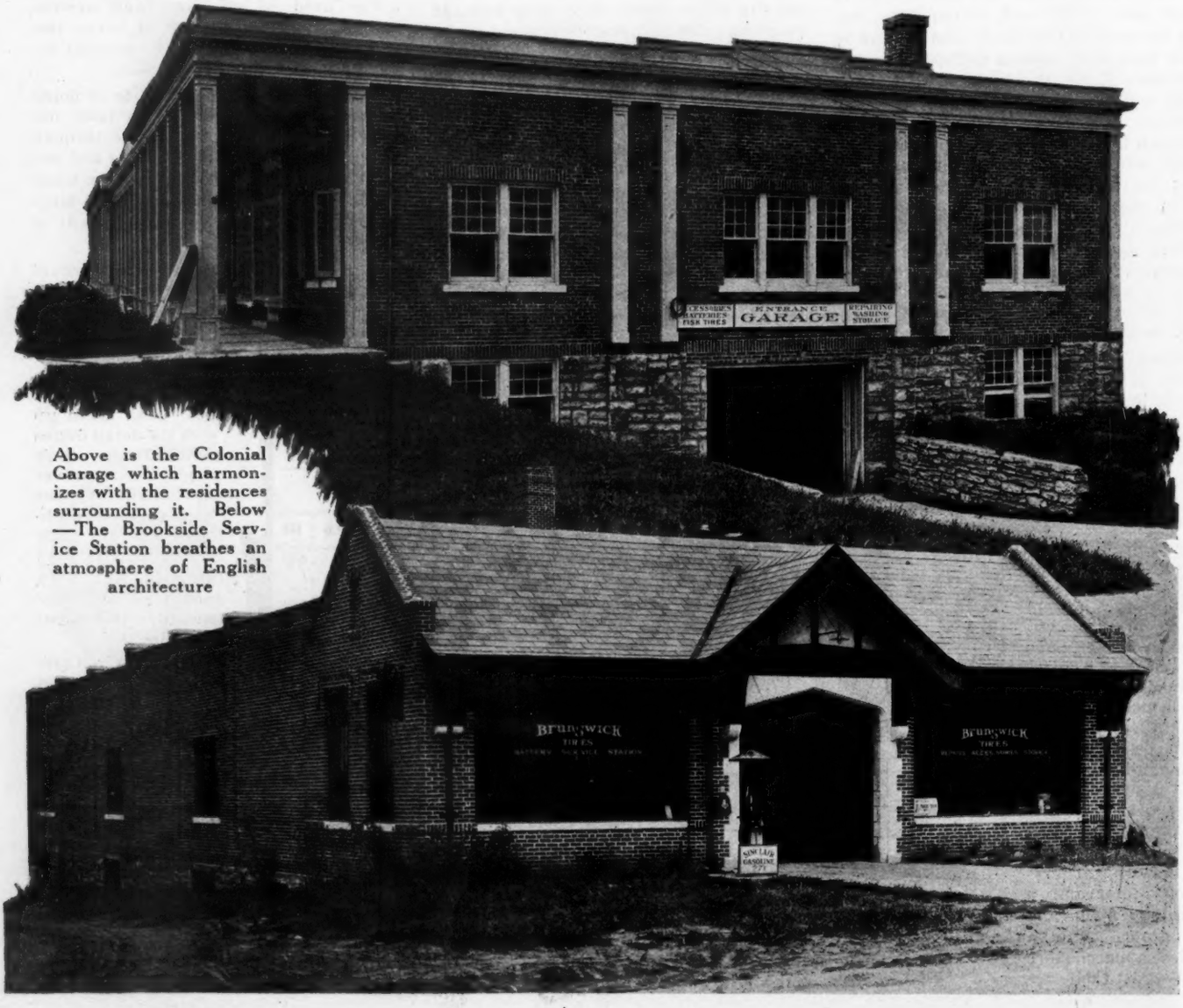
IT IS a noteworthy fact that the service station and garage as a structure is rapidly getting to the point where it fits into our exclusive residence districts without offending the tastes of the most fastidious. A service station well managed and kept clean has as much right in a residence district as an ice-cream parlor.

THE service station and garage is appearing in a new role as a leading factor in the development of the exclusive residence district. Real estate promoters who were formerly prone to look upon the service station as the neighborhood eyesore and a reducer of real estate values are accepting the community service station as a practical necessity. Built along individual English lines to harmonize with the architecture of the district, the community station may be made as attractive as the high class residence.

An investment company of Kansas City, which developed the exclusive residence districts of Country Club, Sunset Hill, Mission Hills, Rockhill and Westmorland has selected the service station as an example of what may be done in commercial development in the restricted community, a commercial development expert was brought from Chicago to take charge of making the community shops and garages in artistic harmony with the architectural development of the district.

ONE OF these is the Colonial Garage, a beautiful example of colonial design, with high columns lining its front, behind which appear artistic windows and doors. The station is finished in colonial cream harmonizing in a large measure with the design and color scheme of the residences surrounding the station. R. L. Boutlier, owner, makes a specialty of day and night taxi service for the accommodation of residents of the district. No unsightly sign boards mark the location of the station.

The second, the Brookside Service Station, is a part of the beautiful shopping and commercial development at that point. The architect of the buildings is distinctively English, with colored tile roofs and art brick exteriors. This station, operated by C. F. Cole and William Davidson, is a pleasant study in harmony with the surrounding residences and buildings.



Above is the Colonial Garage which harmonizes with the residences surrounding it. Below —The Brookside Service Station breathes an atmosphere of English architecture

How the Orchard Tractor is Performing in California

Motor Age Here Presents the Findings of a Trained Observer Who Surveyed Tractor Conditions in the Pacific Coast Fruit Growing Districts. This Article Tells the Potential Demand for the Orchard Tractor and Its Necessary Mechanical Qualifications—Read It

THE most interesting phase of the tractor situation in California is the development of the orchard tractor. This is something comparatively new in the tractor industry and has resulted in the production of a distinct type of machine.

The fact that three well-known makes of tractors, selling in the orchards of California, are sold for other than orchard work in many other parts of the country, does not at all detract from the truth of the foregoing statement. Because the potato grower in Maine, or the dairy farmer in Wisconsin, or the diversifying farmer in twenty states in the North, East, South and West, buy and use the International 8-16, and the Fordson, and the Cletrac, practically in the form in which they are sold in California for the orchard does not affect the validity of the assertion that these are specialized orchard machines.

IT happens that only one of the three, namely, the Fordson, was designed originally without thought of orchard needs. By sheer force of circumstanes, the Fordson, with some minor and unimportant modifications—modifications which in no way affect the fundamental design of the machine—was found to be adaptable for orchard work.

The other two, the International 8-16, and the present model of the Cletrac, actually were developed in the midst of California conditions and with an eye almost single to the desirability of their immediate acceptance by the California orchardists.

ORCHARD conditions are more pronounced in California than they are anywhere in the country, that is, they are more nearly universal, thus making California the ideal location in which to design and try out a type of specialized machine. So nearly universal are orchard conditions in this part of the country that manufacturers and dealers estimate that at least 80 per cent of all the present and prospective trade on tractors in California will be on the orchard type.

And what is the fact in California is the fact throughout the fruit growing districts of the entire Pacific Coast region. This includes not only the citrus, olive and nut groves of Southern and Central California, but also the deciduous sections of Northern California and all Western and Central Oregon and Western Washington. Included in this fruit area must be the Western vineyards, for which the orchard tractor also has been found adaptable.

Conditions the Same Everywhere

In this connection, also, is the interesting probability that the orchard tractor, as it has been developed, and as it is now selling extensively in California, will be found just as adaptable and just as necessary in orchard and vineyard districts in other states in the Union as it is now adaptable and necessary in the Pacific Coast states. Probably the fact that there was not anywhere else a section of the country in which orchards predominated so overwhelmingly as they did in California is the reason why the need for such a tractor was not recognized before.

Trees and vines have a habit of growing pretty much the same everywhere, so that in all sections where there are orchards and vineyards a demand exists for the orchard tractor. The fact that this demand still lies latent and unrecognized will not militate against the specialized machine. It merely provides an enlarged opportunity to merchandise it. But more will be said about this phase of the potential demand for the orchard type machine later.

Southern California Reclaimed Desert.

When one considers the conditions which are found, particularly in the citrus orchard district in California, the necessity for the development of the specialized orchard tractor will become apparent. Notwithstanding the fact that Southern California now resembles a garden, it is in reality reclaimed desert.

California normally has a rainy season which corresponds to the late winter and early spring months of the Central West. For a short time after the rainy season the fields are green and the desert blossoms like a rose. But when the rains cease, desert conditions resume sway and the hills grow brown and bare and the desert flowers disappear. Only along the borders of a few streams, which continue to trickle during the summer, is there a sign of green.

But with water on the desert soil, the whole region becomes the garden it is today. Water must be pumped, however. This makes irrigation universally necessary. From May until November California orchards must be irrigated every two or three weeks, and cultivation of the orchard must follow every second application of water.

Frequent Cultivation Necessary.

The necessity for frequent cultivation of the orchard makes the use of the tractor not only highly desirable but almost imperative in California. The labor situation is much as it is everywhere else; men are difficult to obtain and are high in price and the work cannot wait. The orchards must be cultivated and there is only a limited time in which to do it. The result is that the orchardists are being forced rapidly to adopt the tractor, and it is estimated that of the 10,000 to 15,000 tractors which which have been sold in the state during the present year from 8,000 to 12,000 will be of the orchard type.

The physical condition of the orchards as they are today determines within narrow limits the type of tractor which must be used. The spacing of the trees, the methods of pruning and the disposition of the stand pipes for irrigation are the principal determining factors.

Tree spacing depends somewhat on the character of the tree. In the citrus orchards, consisting principally of orange and lemon trees, present day custom is to set trees at distances of from 18 to 22 ft. one way and from 20 to 22 ft. the other. The spread of citrus trees is not great, rarely exceeding 14 to 16 ft.

In general the plan of irrigation followed is the sub-irrigation system. By this method water is conveyed from the pump through underground conduits or pipes to stand pipes which protrude from the surface of the ground at the end of the tree rows. The water wells up through these standpipes and follows temporary trenches plowed in the ground after cultivation.

The Irrigation System.

Practically the same spacing and the same standpipe conditions exist in the deciduous groves, but commonly these latter trees are pruned higher from the ground. It is not unusual to see a 4 or 5 ft. trunk on peaches, prunes, cherries and apples, although even these sometimes are permitted to branch close to the ground.

Walnut and other trees are larger in general, are spaced at wider intervals, have a wider spread of branch and commonly show from 5 to 6 ft. of trunk. Indeed, the clearance in most nut groves is ample to permit the ordinary small tractor to run under the limbs close to the trunk. But as the same ranch not infrequently has citrus and nut trees, and sometimes deciduous trees as well, it must be evident that the orchard tractor must be designed to meet the extreme conditions presented by the citrus groves.

Another physical condition which has become established is that if the fruit crops in any of these orchards is to be normal a cover crop must be grown. Ordinarily this will be alfalfa, although sometimes barley is used. This cover crop never is cut. Always it is plowed under to put humus into the soil.

Work in Cloud of Dust.

Lastly, the constant working of the soil in the orchards leaves it in a very mellow and loose condition and, except immediately after irrigation, it is dry and dusty. In fact, the tractor nearly always works in a cloud of dust. Bad as this condition is when cultivating after irrigation, it is very much worse when spraying. It is not unusual to see nothing but a cloud of dust approaching, which, on settling, reveals a tractor at work. Pictures of such operations, when developed, sometimes do not show the tractor at all.

The problem, then, which confronted the tractor manufacturer was to design a tractor which would meet all of these conditions, which, admittedly, did not exist five years ago over sufficient areas anywhere else in the country except in California. Perhaps it was for this reason that, except in the case of the Fordson, and that more or less inadvertently, no specialized orchard tractor evolved. Neither was such a machine considered as a possibility in California even, until some of the smaller of the Eastern built agricultural tractors, which began to make their appearance some five years ago, found their way out to the coast and were seized upon by the orchardists out there who had begun to feel the pinch of labor scarcity.

Almost immediately a great demand for a specialized orchard type of tractor sprang into being. Early experiments convinced both the orchardists and the manufacturers that some of the machines as they were would nearly fill the bill, but not quite. A few of the tractor manufacturers, visioning the possibilities, began studying the conditions and undertook to modify their machines to meet them.

The conditions to be met have been described. The Fordson tractor almost met them without premeditation. So did the Cletrac, but the model of the Cletrac sold in California three years ago developed some structural weaknesses which its makers realized would have to be corrected if it were to get its proportional share of this new demand. So the Cletrac engineers spent several months on the coast perfecting the present model, which is meeting the conditions admirably.

Tractor Concerns After Business

The International Harvester Co. worked out its present 7-16 International model in California, and at once began to secure its portion of the trade. Soon other concerns as well came into the field. The Fageol, a California product, especially designed for orchard work, is gaining in trade and popularity. The Avery, with its 6-cylinder tractor, the Allwork orchard model, the Case 9-18, and the Wallis, all made necessary modifications to satisfy the need, while the Stockton, another California tractor, also entered the race. Quite recently the standard model of the Moline-Universal has been so changed that it, too, is now adaptable. Other concerns are casting longing eyes in the same direction and it is probable that another year will see several other tractors with well-known names in orchard tractor forms. Among these will be the Hart-Parr.

It is noteworthy that all of these machines have been compelled to conform to certain fundamental requirements. There is no standardization of type, however. Indeed, considering the variety of tractors involved, standardization of type is an impossibility. But all, regardless of type, are compelled to conform to certain dimensional limitations, to adopt certain modifications of wheel type, hitch, etc., and to add certain accessory parts like shields and air cleaners.

Orchard Tractor Requirements.

The first consideration is "height over all." This hardly can exceed 55 in. Indeed, the Fageol, which is the lowest of all, is only 52 in. in extreme height, and limits its drive wheel diameter to 40 in. The Avery, the Cletrac, the Stockton, and the Allwork are just below or about 55 in. The Fordson and the Wallis are a trifle higher, but get across all right by shielding the wheels. The new model Moline-Universal has straightened the goose-neck front axle which is standard and has reduced the drive wheel diameter by 8 in. This brings it just to the limit of the 55 in. requirement.

It is obvious why a tractor of greater height cannot meet conditions. All of these machines, with the exception of the Wallis, are 2-bottom capacity. This limits them to about an 8-ft. disk. To disk close to the trunk of the tree, the tractor must run so near the tree that it must pass under the limbs. Were it higher than 55 in. it could not do this without serious injury to the tree.

(Concluded on page 27.)

Fundamental Requirements of the Orchard Tractor

Height—Not to Exceed 55 in.

The tractor must run close to the tree and were it higher than this it would injure the limb.

Mobility Highly Desirable

In order to avoid standpipes and turn quickly, the orchard tractor will have a short turning radius and steer easily.

Lugs on Driving Wheels

Light soil is characteristic of orchards and special lugs or grousers must be fitted to the driving wheels. They should be from 5 to 6 in. deep and self-cleaning.

Flexible and Swinging Drawbar

Rigid drawbars are undesirable for this work and where the manufacturer has failed to realize this, the dealers have put on flexible hitches.

Shields for Driving Wheels

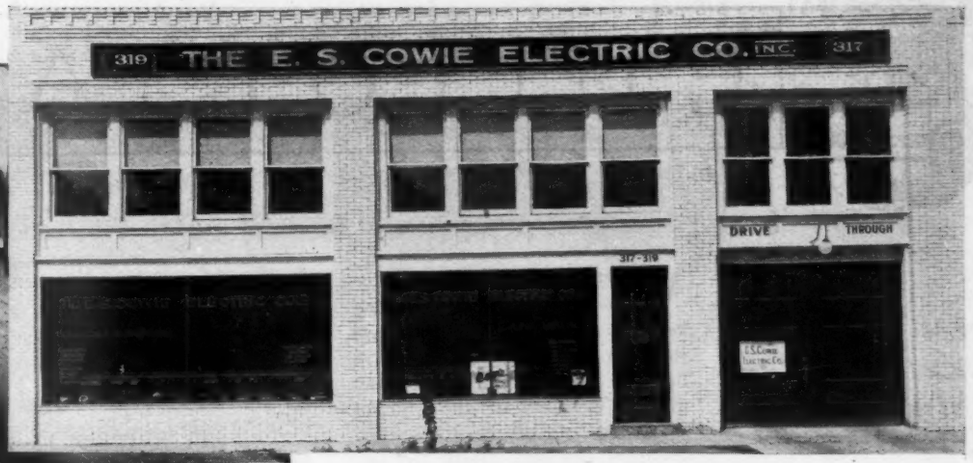
The orchard tractor must present a smooth exterior to the hanging limbs to prevent injury to the tree.

Air Cleaner

Because of the dusty conditions an efficient air cleaner is highly essential to the operation of the tractor.

An Electric Service Station Affording Good Suggestions

Magneto and generator department. Note cut-away benches allowing workmen to stand close to work



The exterior of this concern's building is very inviting

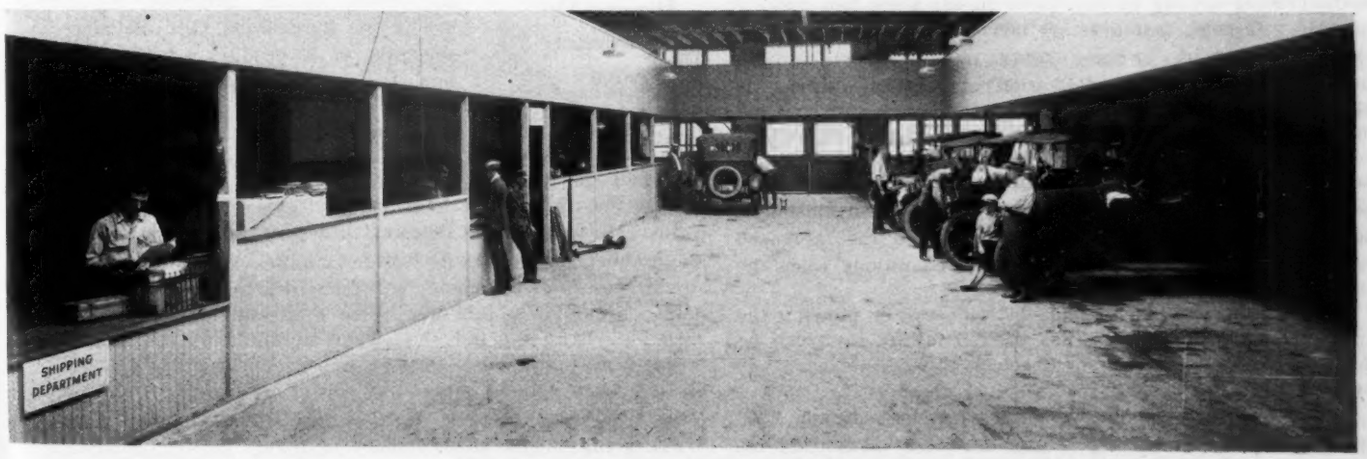
The battery department is 12 by 80 ft. and arranged for quick service

CLEAN cut business methods, one-day service on out-of-town business, reasonable prices and a neat and clean shop largely have been responsible for the success of the E. S. Cowie Electric Co., Wichita, Kans., whose establishment is shown in the pictures herewith. This concern opened four years ago with three men and to-day employs twenty men. The building is 50 by 152 ft., being set in 5 ft. from the alley line to afford a good turning radius out of the building. The plan is for cars to drive in from the front and out of the rear.

The building is white enamel brick, office 40 by 35 ft., and from office line a twelve-foot deck all the way round. Four large skylights in room make every corner well lighted, even on cloudy days.

All shipments go first to the shipping department, where proper record is kept of incoming and outgoing shipments; from there material goes to stockroom, immediately above, with the use of rope elevator. Stockroom has shelving grouped against the wall at a right angle to the wall, so that light goes in each aisle between shelving. From floor to deck, 10 ft., and from deck to girder, 7 ft. Deck suspended from roof.

Shop benches are cut away to permit a workman to stand close up to his bench. Each bench has two drawers, one on each side, and the top is of maple. The first four benches are used in magnetic repair work and balance in generator repairing. Machine-shop on rear end of deck with daylight on machinery. Note the daylight working condition.



This is the service floor layout of the E. S. Cowie Electric Co's., Wichita, Kans., branch. Note light falls on cars only where necessary for electric work

EDITORIAL

REMOVING NEXT WINTER'S SNOW

WITH the coming of winter the people living in those sections of the country where the snowfall is heavy are brought face to face with the annual problem of snow-bound highways and the resultant payment of the bill. With the improved highways built and being built the problem of keeping the roads, city streets and highways clear in winter becomes more important. The maintenance division of a railway pays much attention to keeping the tracks clear in winter because a tie-up of traffic means a big financial loss. There are losses in the same way when the highways of the country are snowbound.

New York's vehicular paralysis during twelve days of February, 1920, meant an economic business loss of $60,000,000.

This eventually became a tax of $10 on every man, woman and child in the city.

Figuring conservatively, the nation's business loss due to the snow invasion of last winter was at least $500,000,000, states The Commercial Vehicle, a Class Journal Co. paper, going to motor truck fleet owners', in its issue of Sept. 1, 1920.

The Commercial Vehicle continues:

Last winter, it is true, was unusually severe. Yet who can say that this winter will not be as bad?

Are we going to allow this tremendous waste to go on unchecked, year after year?

If our streets and highways are to be 100 per cent efficient, it is essential that the traffic be not obstructed by snow.

Affects Automotive Sales

While the snow removal problem in its economic aspect affects every taxpayer in the nation, its solution is of particular importance to the automotive indusry. The fullest development of motorized highway transportation and the motorization of the farm cannot be accomplished so long as conditions in our snow belt make it necessary in some instances for large fleet owners to lay up their trucks for two or three months out of the year and use horse sleds to make their deliveries. Automotive dealers are also affected by snow because the sale of automotive equipment depends upon the ability of the purchaser to use the equipment economically. The owner and operator of the vehicle has perhaps the most direct interest in snow removal because he comes into closest contact with it and must first pay the bills caused by idle equipment and the increased repairs resulting from the unusual road conditions when the snow is not removed.

Greater progress can be made in removing or plowing the snow in two hours after it has started falling than can be made in ten hours after it has become packed and hardened by traffic.

In the removal of snow on country roads, the same State highway organization which is used for maintenance and repair work should be employed for snow removal.

Machines instead of manual labor should be employed to the greatest possible extent. The hand shoveller should be eliminated wherever practicable. Motorized plows, mechanical loaders, steam shovels and other forms of contractors' equipment which is usually idle during the winter months should be employed to the greatest possible extent.

CONFIDENCE, DEALERS' GREATEST ASSET

OPTIMISM founded upon thorough realization of the vital position motor-driven vehicles have made in the world's commercial cycle, is apparent to-day among merchants in this industry as in no other. Probably in no post-war and pre-election periods has any one field of activity supported itself so magnificently in the face of many adverse problems.

There is no better time than now for some earnest reflection on the part of dealers. It is a time for not only inventory of stock, but far more important, of selling policies. These are changing times. We are emerging from a buyers' market, in which the burden lay upon the manufacturer to produce sufficient goods, to a seller's market in which the burden will be placed upon the dealer to dispose efficiently of larger volumes of goods. It is to be a time of greater prosperity for those dealers who by careful institutional policies build up their greatest asset, confidence—confidence in your merchandise and confidence in your judgment as an automotive specialist.

Automobile dealers as a class have been so prosperous that they have not fully appreciated their influence in the sale of cars, supplies and service. This influence is vital. Intelligently capitalized by conscientious selling and servicing and by consistent advertising, it has yet to fail in building up a highly successful institution.

Sell yourself and your business to the community in which you operate. Do it yourself and your employees will do it. Do it by deeds as well as by words. Do it in newspaper type and circulars. Become so firmly entrenched as an authority in all matters automotive that the mere selection of a product by you will settle any doubt as to its merit.

Depend On Dealer's Advice

With the number of manufacturers constantly increasing, each claiming a product superior, the majority essential to economy, prospects are realizing they must depend upon the integrity of their dealer as to whether this or that is a satisfactory and advisable investment.

Success from now on is going to depend upon what people think about you as a dealer. Every minute, every dollar spent to cultivate their confidence will trim "overhead" from future sales. Think of it this way. The Financial Age was from 1880 to 1900 in the industry, when to round up the money meant a manufacturing success. The Production Age of 1900 to 1920 when volume output was solved came next. Nineteen hundred twenty forward we face the Merchandising Age. We're going to get goods, plenty of them. Isn't it, then, a propitious time for every forward looking dealer to make certain his organization is in tune and his influence pronounced?

Conservatism Shown In Middle West

Bankers See Tight Money Continuing for Sixty Days
Students Throughout the Country Find Post-War Readjustment Carried on Without Economic Calamity — August Brings Satisfactory Developments

CHICAGO, Sept. 3.—Following the urgent appeal sent out, arising in a large measure from the dearth of liquid capital and bank credit restrictions, that prudence be observed in all lines of business, the Middle West has shown a conscientious regard in conducting its business with a decided show of caution. To it the need of making time has been patent.

There is every indication that the appeal for caution has reached out of the industrial line and has affected the individual purchaser. Consumers are not now as active as they have been in the past, when there was much extravagant buying of all commodities; they are taking longer time over their purchases and paying stricter account to them. The restriction of credit has tied up their purchasing power to an extent, but buyers with cash are displaying a more conservative attitude.

CONVERSION of inventories into cash has been the natural sequence of the banker's attitude and this has had a wholesome influence on industry and trade in general. With the jobber restrained by credit restrictions from cornering any commodity and refused loans until he had disposed of much of his product on hand and with his consequent inability to continue with his purchases until he had conformed with the edicts of the financiers the burden was shifted to the manufacturer who found himself in much the same position as the jobber. The liquidation of these stocks, while it may result in some hardship through the adjustment of wage and price factors, is admitted as being necessary to the restoring of normal economic conditions.

Farm Reports Good

Reports from the vast farming districts of this section are encouraging, showing that bins are being cleared of last year's harvest as quickly as possible though process naturally is slow. The marketing of this warehoused grain, which is progressing more favorably with an added supply of freight cars to handle it, will release a large amount of frozen credit.

That there are plenty of funds available to move the new crops is the opinion of one prominent banker of Chicago who says:

"Moving of crops will not require any unusual amount of money this year. It was banking opinion in some quarters several months ago that there was likely to be an extremely tight money situation in the autumn so large preparations were begun. It now appears that these preparations will be ample."

The accumulation of those surplus funds, however, was more difficult than in normal years due to the fact that large amounts of credit were tied up in transportation tie-ups, in the holdover from last year's crops and in the goods left on merchants' shelves.

Much, of course, in the matter of handling the crops depends upon the ability of the railroads to cope with the situation. The tension already has been relieved to a great extent by the withdrawal of freight cars from manufacturing interests and concentrating them in the grain belt. While the manufacturing interests are suffering because of this it is recognized that the crop movement, through adequate facilities afforded it, affects all lines of industry and until the crops have been moved there can be no very appreciable relief in credit conditions. It will take sixty days before the movement has passed, it is the view of bankers here, and for that length of time the money market will continue tight.

The steel trade, always a barometer for industrial conditions, is affected somewhat through difficulties in the way of transportation and fuel, this condition relating more specifically to plants which have sufficient orders on hand to justify large production.

Actual Orders Are Expected to Follow Interest in Truck Parts

NEW YORK, Sept. 2.—Careful and competent students of the situation have arrived at the conclusion that the post-war readjustment, which was inevitable, is being brought about gradually and in such a way that it will be accomplished without financial disaster or any economic calamity. As it relates to the automotive industry they find no occasion for the increase of pessimism and depression in the past few weeks. The unpleasant situation which now exists was predicted weeks ago and should have been discounted.

There seems to be a general revival of interest in the truck parts and this interest probably will be followed before the first of the year by actual orders. Many of the parts makers have found considerable new business but are getting less than might have been expected from their old customers. Some of the parts makers were badly over-sold and others fell down on their deliveries.

"A definite trend seems to be slowly developing toward a gradually increasing gain of supply upon demand and a somewhat lower level of prices," says the committee on statistics and standards of the Chamber of Commerce of the United States. "Here and there mills have shut down. Here and there they are running on reduced time. It is a scattered and local matter rather than a general proposition. The automobile industry seems to be headed toward a somewhat lessened output."

All Industries Curtailed

The Federal Reserve Board points out that industrial activity in many lines has been shortened in consequence of lowered demand, cancellation of orders and general readjustment. Inadequate transportation is mentioned as the cause of the labor surplus.

In general, however, manufacturing organizations have succeeded in enlarging their efficiency through a better spirit of co-operation manifested by employees.

The National City Bank, the greatest financial institution in the United States, asserts in a general review of business conditions that August has brought satisfactory developments.

"There is a better feeling in banking circles as to the credit situation although money will remain tight," the review says.

The Federal Reserve Bank of New New declares that "manufacturers and merchants have at last come to realize that the period of constant expansion of the past few years, based upon the constant increase of the buying power through credit expansion, should cease and that they should content themselves with a more stable and conservative volumne of business."

Discussion of Situation Opens N. A. C. C. Activities for Season

Motor Truck Committee Goes Over Conditions in Industry—Many Favorable Omens Seen

NEW YORK, Sept. 8—The National Automobile Chamber of Commerce will begin its Fall activities with a rush this week. The vacation season is over and Alfred C. Reeves, general manager, one of the last to get away, returned to his desk last week ready to buckle into an arduous fall and winter. While there has been a sharp decline in automobile output which now is variously estimated to range from 35 per cent to 50 per cent of normal, Mr. Reeves is by no means down-hearted. He points out that the slump has hit almost every other line of business almost as hard and in some cases harder. He has been through other periods of stress and realizes that when the storm is over the industry will emerge stronger than ever.

Favorable Future Seen

The first meeting of the week on the N. A. C. C. program was the session of the Motor Truck committee to-day at which Secretary Fenn made his report. Conditions in the industry were discussed thoroughly and while there has been a marked falling off in demand the members of the committee were by no means discouraged. They could see many favorable omens in the situation.

The directors will be in session to-morrow, taking up routine business which has accumulated during the summer and considering the general situation in the industry. One of the subjects discussed will be the increased freight rates. It is estimated they will add between $18,000,000 and $20,000,000 to the annual shipping bill on completed automobiles to say nothing of increased charges on parts and all kinds of raw materials.

The Motor Truck Sales Managers association will meet Friday and Saturday to discuss sales problems, credits and kindred subjects.

It was announced at the Chamber that drawings for space at the New York and Chicago shows will be held at the headquarters here Thursday, Oct. 7.

McCLAREN TIRE ON MARKET

Charlotte, N. C., Sept. 7—H. L. McClaren, president of the McClaren Rubber Company, is making a swing through the east while vice-president Charles R. Collins is on a western trip. Production of the McClaren Autocrat cord tire now is under way and distribution has begun.

REPUBLIC TO RESUME THIS MONTH

Alma, Mich., Sept. 3.—Republic Truck Co., which closed down about two weeks ago for the annual inventory, will not reopen Wednesday as planned. The inventory practically has been completed but according to Vice-President Hayes, the company has been handicapped in not getting necessary parts in sufficient quantity to justify resumption of operations Sept. 1 and expressed the opinion that the plant would not start again before Sept. 15. Mr. Hayes said the company had been shipping many trucks during August and declared estimates for September showed the slowing up in demand rapidly was passing and indicated normal healthy conditions would be restored within the next sixty days.

Trucks Show Efficiency In Doubling Distance of Hauls

Grand Rapids, Sept. 3—Efficiency of the motor truck was demonstrated clearly here to-day when five farmers pulled into town from distances ranging from fifty to sixty-five miles with fruit and produce for the morning market. Heretofore the horse haul of twenty miles was considered extraordinary and a twenty-five mile trip was the absolute limit. Market receipts to-day included a load of apples brought 65 miles from Six Lakes; a load of peaches brought from Pullman, 54 miles; tomatoes from Nashville, 50 miles; peaches from South Haven, 60 miles and celery, from Kalamazoo, 50 miles.

STANDARD PARTS SOLVENT

Cleveland, Sept. 1—The differences between the majority and minority stockholders have culminated in the appointment of receivers for the Standard Parts Co., a $25,000,000 corporation of this city, by Judge D. C. Westenhaver in Federal District court. In appointing the receivers, Judge Westenhaver declared emphatically that the corporation is not insolvent. It has debts of only $9,500,000 and assets of approximately $22,000,000. He expressed the hope that the receivership would be only temporary and that the property soon would be restored to the stockholders. The receivers are J. O. Eaton, president of the company, and Frank A. Scott, treasurer of the Warner & Swasey Co.

SAYERS IN FULL PRODUCTION

Cincinnati, Sept. 1—The Sayers & Scovill Co., manufacturers of the Sayers Six, state that production of the new 1921 series is now in full swing. According to E. E. Hess, general manager, the factory is behind on all models and plans are being completed for an immediate enlargement of their schedule to take care of the increasing demand.

ACQUIRE AIRPLANE PLANT

Buffalo, Sept. 3.—The Poll-Eells Airplane & Motor Corp. has acquired a factory here and is shortly to begin quantity production of an all steel airplane for strictly commercial use, according to H. R. Pollay, one of the incorporators. Mr. Pollay was formerly chief designer at the Curtiss plant at Hammondsport, N. Y., and Fred Eells, his partner, designed the first NC plane to cross the Atlantic.

Governor of Federal Reserve Board to Address Association

Motor and Accessory Manufacturers Will Hear W. P. G. Harding on Finances and Credits

NEW YORK, Sept. 7—W. P. G. Harding, governor of the Federal Reserve, will be the principal speaker at a joint meeting of the credit and advertising departments of the Motor and Accessory Manufacturers association at the Hotel Statler, Cleveland, the afternoon of Sept. 16. It will be the first official appearance before the automotive industry of one of the most powerful figures in the finances of the world.

The general theme of the Cleveland meeting will be, "Conditions in the Industry," and Governor Harding is expected to discuss the financial and credit situation from this viewpoint. The session is expected to be one of the most important ever held by the association. The directors will meet while it is in session and executives and general managers of the leading parts manufacturers of the country will be present as well as their credit and advertising men. Prominent representatives of the automobile manufacturers and dealers also have been invited to attend.

Governor Harding to Speak

Men best qualified to speak for the various branches of the industry will tell of conditions as they are to-day and what may be expected to-morrow. Every effort will be made to develop helpful suggestions and foster a spirit of co-operation. The general session Thursday afternoon at which Governor Harding will speak will be followed by a banquet Thursday evening. No program has been mapped out for the dinner but at the one last year there were no speeches and the entire evening was devoted to cabaret features and food.

Friday morning the credit men will begin their own session with a discussion of technical credit subjects and the advertising managers will take up themes of vital interest to them.

"How Should Present Conditions in the Automotive Industry Affect Our Advertising Plans" will be the subject taken up by the advertising men Friday morning. It will be taken up in detail in its relation to national magazine, trade, newspaper, direct mail, outdoor and motion picture advertising. The general subject will be considered by William Huff, advertising manager of the Detroit Pressed Steel Co., and the sub-division by the men best qualified to tell about them, whether they are found inside or outside the industry. Twenty minutes will be devoted to the various headings. There then will be a general discussion.

Only one paper is scheduled for Saturday. The subject will be, "Keeping Track of Your Advertising Dollar," and the speaker has not been announced. It will be devoted, however, to a discussion of the best means of measuring results.

Northern California Dealers See Relief in End of Harvest

Facing Complex Situation but Are Selling Cars as Fast as Deliveries Can Be Made

SACRAMENTO, Calif., Sept. 3.—With harvest over and crops moving out of the state rapidly, automobile dealers of Northern California see relief in sight from the situation which has retarded the sales business to some extent in the past few months.

In Sacramento, according to W. H. Mannix, president of the Sacramento Motor Car Dealers association, there has been little business held off because of the banks. In other sections of the state, however, the banks acting upon what are said to be orders from the Federal Reserve Bank, have refused to handle the contracts of motor car dealers in their sales, until the crops have been moved.

Freight Rates Advanced

But, another phase of the complex situation is worrying dealers on the Pacific Coast. With freight rates advanced 20 per cent, and indications of further factory increases in the price of cars, the automobile is jumping skyward so fast in price that many prospects are shying away. The freight increases mean an addition of from $25 to $75 on each autobile, and the factory increases must also be added.

Another feature is the increasing cost of gasoline. A year ago fuel for motor cars was purchased here for 22 cents, while now it sells for 27½, an increase of 25 per cent. Oils have increased in the same proportions, as have all other costs of maintaining and operating a car. So the motorist is confronted not only with an increased first cost amounting to about 25 per cent, but a cost of maintenance that has gone up in like ratio.

Nevertheless, dealers are selling cars as fast as they can get them, and the farmers, who have splendid crops, are likely to absorb the entire California allotment, even if the demand in the urban districts should fail.

Brooklyn Motors Working During Street Car Strike

New York, Sept. 3.—Brooklyn would have been forced practically to suspend business on Aug. 30 but for the automobile. With passenger cars, trucks and buses filling the gap in transportation caused by an all but complete tie-up of the Brooklyn Rapid Transit system—surface, elevated and subway—virtually the entire working population of the city got to business, a great portion of it on time.

A strike which paralyzed the transit system began Saturday at midnight and by 9 a. m. Sunday enough automobile transportation had been mobilized to meet the needs of non-workday traffic. Monday automotive vehicles, drawn from Brooklyn, Manhattan and New Jersey, appeared at 6 a. m. to transport passengers on all the main thoroughfares and accommodations were plentiful throughout the rush hours of the morning and late afternoon.

Industrial and mercantile plants of Brooklyn, as well as businesses in Manhattan dependent upon Brooklyn dwellers to man them, expected to operate without serious curtailment throughout the strike.

NO BAR TO LEFT-HAND CONTROL

London, Aug. 18.—The movement for prohibition of the left-hand control of motor vehicles in Great Britain has been defeated. The Departmental Committee appointed by the Ministry of Transport to consider this and other matters concerning highway vehicle traffic has rejected the petition to permit only right-hand control. This effort to bar the left-hand control is believed to have been chiefly inspired as an effort to check the importation of vehicles of American and French manufacture. The committee recommends the adoption of a simple code of signals to be shown on the "off" side of the vehicle, to be agreed upon at the proper time. There have been many elaborate devices patented for displaying signals from the left-hand control cars, but most of these are cumbersome and non-effective.

Dealers Association Warfare Cutting Number of Car Thefts

Making Campaign to Educate Owners in Ways to Protect Automobiles and Accessories

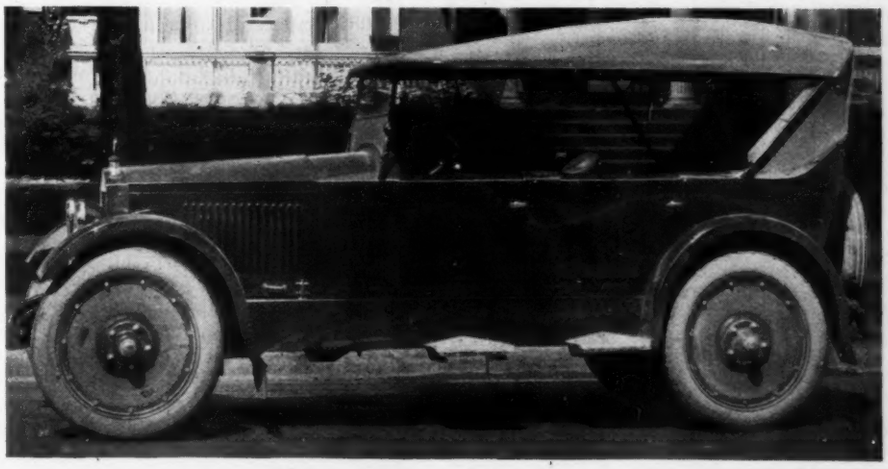
SAN FRANCISCO, Sept. 4.—Due to the incessant warfare being waged against the automobile thief by the San Francisco Motor Car Dealers' Association, the number of reported thefts in the last three months has been cut nearly in half, according to a report just issued by Elliott Epsteen, special prosecutor for the association.

The report shows that in May, 1919, there were 118 thefts as against this year's 62 for the same month. In June, 1919,there were 146 and in 1920, 78. In July of last year there were 125 as against 77 this year. All of which sounds very encouraging to everybody except the automobile thief.

A campaign to educate the car owners in ways to protect their cars and accessories from being stolen is now being undertaken by the association in a further attempt to reduce the number of automobiles stolen in this city.

All owners are urged to buy wheel-locking devices or other mechanical safeguards to prevent car theft. The same precautions are urged in the matter of tires, as these are easy to steal and dispose of unless properly guarded.

Jackson Introduces Unusual Open Model Six



THE name of the newest Jackson model—the "Semisport"—is descriptive of its type. This car is neither a touring car, as the term is conventionally used, nor is it purely a sport model. Rather is is a happy medium which embodies all the outward characteristics of a snappy sport car, yet is a roomy five passenger vehicle.

The chassis, which is built on a 121-in. wheel-base, is powered by the Continental type 7-R six-cylinder engine, of 3¼ bore and 4½ in. stroke. This engine has a four bearing crankshaft. The carbureter is a one-inch Stromberg to which pre-heated air is supplied by an induction tube from the exhaust manifold. Vacuum type fuel system is used and the eighteen-gallon gasoline tank is so placed that it is protected by the rear member of the frame.

Other chief units of the chassis are Covert transmission, Borg & Beck dry-disk clutch, Thermoid universal joints and Salisbury axles, both front and rear.

Buyers will be permitted the option of a considerable variety of attractive colors. The price of the five-passenger Jackson "Semisport" is $2550, fully equipped.

Rise in Freight Rates Due to Affect Prices of Automobiles

Will Increase Cost of Getting Raw Materials to Factory and Cars to Distributor

SAN FRANCISCO, Sept. 4.—L. M. Stewart, manager of the local branch of the Willys-Overland Co., has returned from the second of two hurry-up trips across the continent, both completed within the last thirty days. His last visit to the Overland factory at Toledo has given him a more optimistic outlook than ever on the question of Overland output.

"Although production has diminished somewhat on account of the difficulties in obtaining raw materials and in getting them to the factory," he says, "the Overland factory is still turning out cars at a rate of better than 500 a day."

He declares that unless cost of labor and raw materials should suddenly drop, a further increase in car prices is due for the near future. One cause of this will probably be the raise of the freight tariffs. Not only will this affect the f. o. b. price of machines, but it will also affect the original cost, he says, for it will increase the cost of getting raw materials to the factory as well as the finished product to the distributor and thence to the customer.

Kansas City, Mo., Sept. 6.—As a direct result of the recent increase in freight rates granted by the Interstate Commerce Commission, the price of gasoline was increased here August 27. The new rates are three-tenths of a cent per gallon over the old prices. The intra-state freight rates, which are up for a raise in both Missouri and Kansas, may tend to add still another increase to that recently made. The surplus of gasoline is low here. In explaining the increase gasoline dealers here said, "the railroads are taxing us and we have to get our money out in some manner." Gasoline is now selling here at 27½ cents a gallon.

BUS LINE FOR CANTON

Canton, Mass., Sept. 3.—Walpole selectmen are enthusiastic over the motor bus service, which has been in operation for over a year, and state that they prefer it to the former trolley system as a mode of travel. The bus line has secured a tentative agreement for obtaining a franchise if it will come into Canton with modern equipment and safeguarded by the required securities to guarantee liability. The concern will be known as the Canton Omnibus Co. Six new chassis have been ordered, three of twenty-three-passenger capacity and three of sixteen.

FOREIGN PRICE OF CARS MAY DROP

Washington, Sept. 3.—The American Chamber of Commerce in London anticipates a general drop in the price of motor cars in Great Britain, according to advices received here today. The prediction is apparetly based on the announcement that Ford and Maibohm cars are to be considerably reduced, the reduction in Fords to vary from 25 pounds sterling for touring cars to 50 pounds sterling for one-ton standard trucks; the Maibohm prices will drop 100 pounds sterling. British manufacturers believe that the reduction is the beginning of strenuous foreign competition inasmuch as the supply has about caught up with the demand for automotive equipment.

TIRE BRANCHES IN ONE BUILDING

Minneapolis, Sept. 4.—Outside of Akron what will be the largest consolidated stock of tire and rubber goods in the country will be effected by October 1 with the removal of the principal tire factory branches from different parts of the city to the Northwest Terminal Co. building. The plan was put under way a year ago and practically all the big company branches are involved in the transaction.

Kreuger at Head of Hare's Motors Milwaukee Branch

New York, Sept. 1.—Harry F. Kreuger has been named president of Hare's Motors of Milwaukee, which will control the distribution of Hare's Motor products, the Locomobile, Mercer and Simplex, for Milwaukee and the eastern counties of Wisconsin; Julius E. Roehr, vice-president, and Thomas W. Cushing, secretary. Mr. Kreuger has been connected with the automotive industry for over twenty years, having organized the Kreuger Mfg. Co., which made automobile parts as early as 1899. He built the Eclipse car from 1903 to 1907 and later became affiliated with the service and sales departments of the Hibbard Motor Car Co., the Wisconsin Motor Car Co., and the Schreiber & Boorse Motor Car Co. Mr. Roehr was associated with Mr. Kreuger in both the Kreuger Mfg. Co. and the Eclipse Motor Car Co.. Mr. Cushing has been connected with the sales end of the industry since 1911.

New York, Sept. 3.—Fred H. Miller, formerly metropolitan district manager of the Packard Motor Car Co. at New York, has been appointed general sales manager of the Hare's Motors of New England. He has been special representative of Hare's Motors and has recently spent some time in the Southern states.

VULCAN SPRING BRANCH SOLD

Kansas City, Sept. 7—The Automotive Supply Co., wholesalers of automotive accessories, have purchased the entire stock of springs of the Jenkins Vulcan Spring Co. branch here. The stock, numbering over 5,000 springs, consists of replacement springs for all makes of cars. About the first of the year the Jenkins company adopted the policy of selling through jobbers. The officials of the Jenkins company will return to the home plant.

Willys-Overland Takes Over St. Louis Automobile Firm

Purchased Property Some Years Ago and Erected Sales and Service Building On It

ST. LOUIS, Sept. 6.—A factory branch of Willys-Overland, Inc., Toledo, has been established in St. Louis to displace the Overland Automobile Co. of St. Louis. The following statement regarding the change has been made by Willys-Overland, Inc.:

"A number of years ago the Willys-Overland Co. purchased property at the southwest corner of Twenty-third and Locust streets and erected one of the finest sales and service buildings in the country. At that time the Willys-Overland Co. entered into a contract of purchase and sale with the Overland Automobile Co. of St. Louis and with mutual consent are now under that contract purchasing the business of the Overland Automobile Co. of St. Louis as of September 1. The Overland Automobile Co. of St. Louis, during the ten years it distributed the Willys-Overland product, handled upward of $25,000,000 worth of merchandise."

AERONAUTIC DEPARTMENT FORMED

Los Angeles, Sept. 3—The Goodyear Tire & Rubber Co. of California has established an aeronautics department, because of the increased volume of business in aeronautics and the need of increased supervision in the work, and has placed as manager P. K. Coe who has had wide experience with the Akron organization. He will also have supervision over the government sales department just established. Mr. Coe was in the Navy aviation service during the war and holds a pilot's certificate from the Aero Club of America.

New Compressed Air Pumping Station for Massachusetts

Worcester, Sept. 1.—A new compressed air pumping station, the first of its kind in the state, for use in the sale of gasoline, kerosene and oil has been inspected by various state officials who came at the invitation of Sealer James A. Healy. The inspection was followed by a meeting in City Hall to discuss specifications which the State Department is preparing for a standard for all mechanicel pumping devices for the sale of gasoline, kerosene and oil.

NEW ZEALAND TO HOLD SHOW

Christchurch, N. Z.—The annual Olympia Motor Exhibition will be held here Nov. 6 to 13. There is a floor space of 40,000 sq. ft. and the management is endeavoring to put up a show far excelling anything previously attempted, with cars exhibited from England, America, France and Italy. There will also be displays of motor trucks, tractors, tires and accessories.

Loesche in Lexington Captures Cup in Pike's Peak Hill Climb

Winning Time Was Not So Fast as Four Years Ago — Cline Second

DENVER, COLO., Sept. 6—The Penrose cup event in the Pike's Peak hill climb today, over a course of 12 2/5 mi. was won by Otto Loesche in a Lexington in 22 min. 25 2/5 sec. Al Cline, also a Lexington, was second in 22 min. 30 4/5 sec. Fred Junk in a Hudson was third in 23 min. 17 sec. The winning time was not so fast as four years ago but showed keen racing and a crowd of 5000 persons were well pleased.

The smaller car event was won by William Bentrup in a Chevrolet in 24 min. 5 2/5 sec. Dave Lewis in an Essex was second in 25 min. 56 1/5 sec.

Part of the course was made heavy by a break in the weather when the races were in progress. Ralph Mulford driving a Paige in the main event was blinded by a snowstorm near the top of the peak and failed to finish rather than risk an accident on the curves or precipices but will stay at Colorado Springs a few days and try to set a record for the course.

The races were conducted by the Pike's Peak Automobile Highway Co. and the Colorado Chamber of Commerce under the official sanction of the American Automobile association.

The corkscrew course starts six miles above the highway gate at the foot of the peak and ends at an altitude of 14,109 feet. The highway is 20 to 50 feet wide, has 60 curves to test the driver's skill and grades of 7 to 10½ per cent and cost $250,000.

Frederich, in Bugatti, Winner of International Light Car Race

(*By Cable to* MOTOR AGE)

Paris, Aug. 30—Frederich, driving an Alsatian built Bugatti, won the international light car race at Le Mans yesterday for machines limited to a piston displacement of 85 cu. in. His time for the 255 miles covered was 4 hours, 37 minutes, 46 seconds, giving an average of 57 miles an hour. Nouguet was second in a Bignan-sport, 20 minutes behind the leader. Bugatti would have won the first three places but for the fact that near the end of the race one of the drivers was disqualified because an outsider unscrewed the radiator filler cap.

(*Bradley*)

FORD CUTS PRICES IN FRANCE

(*By Cable to Motor Age*)

Paris, Aug. 30—Following the course he already has set in England, Henry Ford has announced a big cut in the prices of cars sold in France. Two seaters without electric starters will sell hereafter for 13,200 francs and with starter for 14,300 francs. The price of 4-seaters without starter will be 13,600 francs and with starter, 14,800 francs. This makes the Ford car the lowest priced on the French market. The nearest French competitors are the Renault which sells for 20,000 francs and the Citroen at 18,000 francs. It is believed here this cut by Ford will force French makers to reduce their prices, especially in view of the fact that the market is very dull at present.

Bradley.

Cities With Ports Escaping Increase in Gasoline Price

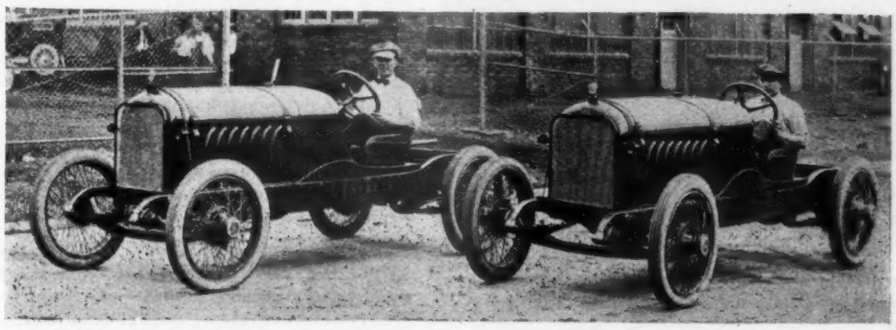
Where Shipment of Fuel Is Made by Water Cost Will Remain Less

SEATTLE, Sept. 2—Seattle representatives of the large oil companies declare that the increased railroad freight rates, effective Aug. 26, will not cause higher gasoline prices here and other points served by water. Points in the state of Washington, however, that must be served by rail, have been raised from one-half to a cent and a half a gallon.

Eastern Washington districts are hit the worst, retail prices ranging from 29½ to 32 cents.

The Union Oil Co. reports it has reached almost a normal basis in gasoline supply, partly due to the lessened demand which marks the passing of the peak of the travel season and partly to weather conditions. In some cases dealers supplied by this company, it was said, have gasoline to spare.

Lexingtons Win Pike's Peak Hill Climb



Otto Loesche and Al Cline driving the Lexington racers pictured above won first and second places in the Pike's Peak Hill Climb Labor Day. This course with its sixty curves and steep grades is a stiff test of car and driving skill

Immediate Production of New Car Expected by Wills-Lee Co.

Company Opens New Offices and Believes Output Scheduled Will Be Built

DETROIT, Sept. 2—General offices of the Wills-Lee Co. in the Book building here have closed and practically all of the officials will in the future be housed in a portion of the new plant in Marysville. A few officials will remain in Detroit and will have headquarters at the plant of the DePalma Mfg. Co. on Woodbridge street, pending the closing of some local business.

The purchasing department has been moved to the DePalma company's offices. A shipload of the machinery and equipment of the DePalma plant was previously sent to Marysville and has been installed in the Wills-Lee factory. The machinery and plant of the DePalma Co. had been used by C. Harold Wills for the conduct of experimental tests.

With the opening of offices in Marysville the company expects immediately to begin production on the new car, description of which is promised shortly.

It was said at the offices that the officials had every reason to believe that the output scheduled for this year would be built despite many delays which the company has encountered.

COMMITTEE SETS USED-CAR PRICES

Minneapolis, Sept. 4—A renewed-car show is the newest feature at the annual automotive show which opened here today. More than 150 used cars were inspected by the technical committee for entry. The price of the cars is based entirely on the reports of the committee. The show is being held on Machinery hill which is in the vicinity of the regular annual tractor show space.

DEALERS MUST PAY TAX

Bloomington, Ill., Sept. 7—The city council has adopted an ordinance effective Oct. 1 imposing yearly taxes of $10 on motor buses, $4 to $8 on motor vehicles other than trucks and $5 to $15 on motor trucks, according to horsepower. Firms engaged in manufacturing or dealing in motor vehicles will be required to pay an annual tax fee of $6 for every dealer's license fee issued.

FORD AT LOUISVILLE ENLARGES

Louisville, Ky., Sept. 7—Duplication of the assembling plant of the Ford Motor Co. here has been authorized. Assembling of farm tractors will be the principal addition feature in the new building. One hundred tractors will be turned out daily. At present none is made here. The capacity for turning out cars will be more than doubled. Two hundred daily is the goal set while now the number is eighty-five. The number of employees will be more than doubled.

Convention Adjourns Without Adopting Uniform Traffic Law

Special Committee Is Named to Put Proposed Regulations Into Final Form

SAN FRANCISCO, Sept. 1—No uniform traffic law for the various states was formally adopted by the National Traffic officers convention before its adjournment though hundreds of recommendations were in hand as the result of a week of committee and general meetings.

So many and so varied complications arose in the course of drafting the law that the traffic experts decided several months would be needed to codify the proposed regulations and put them into final form. A special committee of nine was named to work to this end and report to the executive committee at Cleveland, Dec. 2.

To Be Presented to States

Many of the proposals for the uniform code were submitted by the California Automobile Trades association which held meetings in conjunction with the traffic officers convention. Robert W. Martland, state secretary of the association, has been made a member of the special drafting committee. Other members are W. H. Maltbie, Baltimore; Percy Towne, San Francisco; David Van Schaack, Hartford; E. W. Braun, Chicago; David R. Faries, Los Angeles; Dr. Clayton Sharp, New York; J. E. McCurdy, San Mateo and J. B. Monohan, San Francisco.

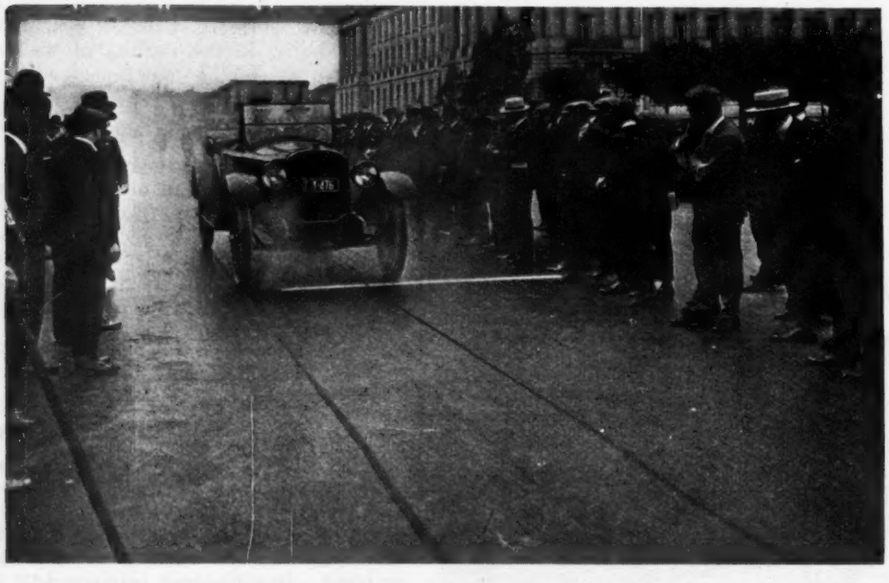
The uniform traffic code which will be drafted will be presented to the Legislatures of all the states. If automotive interests are successful in bring about general acceptance of the law, the same regulations will prevail in all parts of the country and the present crazy-quilt patchwork of laws which governs the nation's motoring activities will be shelved for all time. Motorists then may cease to worry about constantly changing rules of the road which make him constantly liable to arrest.

Columbia President Predicts Early Money Relief for Dealers

Detroit, Sept. 1.—Curtailment of production as a result of the tightening of credits means still further delayed deliveries, according to J. G. Bayerline, president of Columbia Motors Co. He urges that prospective purchasers should recall the trouble in securing cars before the credit stringency cut production and take into consideration the fact that the restricted output necessarily will make it even harder to get them when the credit ban is lifted everywhere and the demand again is normal.

Present conditions are not going to last forever, says Mr. Bayerline, and contends that before long money will be easier to get by both dealers and individual borrowers. Meanwhile the restricted output of automobiles is being consumed by those persons financially able to buy without credit and a return to normal conditions will find dealers without the cars to supply the demand. Mr. Bayerline adds in urging the early placing of orders by prospective buyers.

Short Stop Demonstrated at Traffic Meet



The accompanying photograph shows a test arranged to show the proper distance in which a car should stop in an emergency, the demonstrating cars turning a corner and pulling up short at various speeds. The street in front of the Exposition Auditorium was turned into an outdoor laboratory, being hosed down by the fire department for the proper slippiness for skidding demonstration. Five Chandler touring cars with as many different kinds of tires staged tire tests. The occasion demonstrated the respective merits of the various makes of tires that were used in the tests as to their safety first and non-skidding qualities.

Determined Efforts of Dealers Brought Out at Iowa State Fair

Salesmen Show Keen Go-after-the Business Spirit to Meet Present Day Conditions

DES MOINES, Sept. 4.—The annual fall show held under the auspices of the Des Moines Automobile Dealers association and the Des Moines Motor Truck Dealers' association, with the full co-operation of the management of the Iowa state fair, was held Aug. 25 to Sept. 3 and reflected the determined, better business efforts which the motor car and truck dealers of this section are putting forth to meet the present day conditions.

It was evident that the dealers had sensed the necessity for buckling on their business armor. In past years the state fair show has not received any great attention from the heads of dealer organizations. It seemed to be the thing to buy a space at the show and put in some cars. A salesman was on the job, but the keen, go-after-the-business spirit was left to the downtown forces. This year there is a different condition. Heads of business, sales managers and star salesmen were on the job and they were working at it.

Business Main Object

The show occupied the major part of machinery hall, containing about five acres of floor space. The hall has unusually wide aisles, which provided good accommodation for the thousands of Iowa visitors. The show made no pretense of appealing to attention by decoration or entertainment. It was purely a business show and entirely without frills or elaboration.

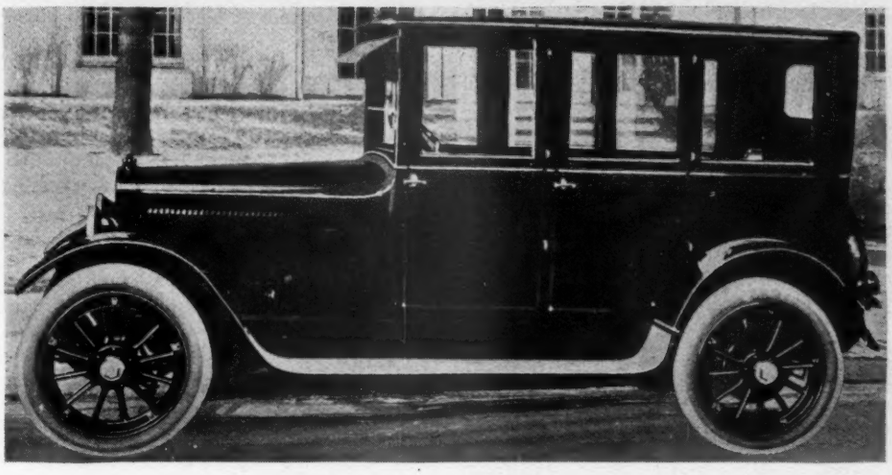
Thirty-four dealer firms showed forty-five lines of passenger cars and thirty-one dealers showed forty lines of trucks. In addition there were thirty-six accessory lines shown and six tire factories had space, of which four were Des Moines concerns.

A short distance from Machinery hall the Herring Motor Co. held its annual power farming show, all of the equipment having been made especially for the show and a greater part of it finished in white. Belt-driven machinery was in motion much of the time.

Friday, the last day of the fair, was officially declared motor transport day by the fair management and at 1 o'clock a parade of 200 motor trucks, including those which had been on display at Machinery hall, formed outside the fair grounds and after moving through the grounds circled the track four abreast before the ampitheatre. This feature was under the management of the Des Moines Motor Truck Dealers' association.

CLETRAC PRICE INCREASED

Cleveland, Ohio, Sept. 6—It is announced by the Cleveland Tractor Co. that the price of the Cletrac is now $1495.



New Saxon Sedan

The Saxon Motor Car Corp., Detroit, is now producing a sedan which is mounted on the Saxon duplex chassis. The new sedan, which is illustrated above, is built in an up-to-date, square line form, with richly upholstered interior. The trimmings are of Colonial silver and the molding of mahogany. The car is equipped with a dome light and two rear reading lights, besides the usual vanity cases, etc. The finish is in Bolling green, except for the parts from the sills of the windows to the top, which is finished in black. The running gear is also black. The price of the car is $2685 f. o. b. Detroit

National Tractor Show Space Is Being Applied for Rapidly

No Admission to Be Charged—System of Registration Being Worked Out

COLUMBUS, Sept. 2.—Applications for space at the coming National tractor show which will be held here February 6 to 12 under the auspices of the Columbus Tractor & Implement Club, W. J. Longhon, president, are coming in rapidly, according to E. E. Whaley, manager of the show, who has opened headquarters at the Deshler Hotel to take care of correspondence and applications.

There are approximately 150,000 sq. ft. of floor space available, contained in a number of large buildings on the Ohio State Fair grounds, inclusive of the immense Coliseum. Many of the larger exhibitors have applied for space in the latter building. Indications point to a huge success as all the space will be sold readily.

Visitors Asked to Register

No admission will be charged, and in its place a system of registration is being worked out. All visitors will be asked to sign a registration card containing his name and occupation and whether a farmer, tenant or owner, together with the number of acres tilled. In addition they will be asked to state if they are power farmers or not. When this list is completed it will be a valuable mailing list for any tractor or implement concern and will be turned over to exhibitors for the mere cost of transcribing it.

Charges for space for members of the national association will be $1 a square foot and for non-members $1.50. The proceeds from the sale of space will be used to pay the expense and the balance will be distributed pro rata among those exhibiting.

Immediately after the close of the annual Ohio state fair the grounds will be put in shape for receiving the exhibits. All business and civic organizations of the Buckeye capital are co-operating toward making the show a success in every particular. The national tractor show committee, consisting of Finley P. Mount, E. J. Gittins, C. S. Branthingham and J. E. Everson, was in Columbus recently going over the details.

Abandon Truck Tour but Will Hold Show at Tri-State Fair

Memphis, Tenn., Sept. 2.—An overwhelming majority of the truck dealers of Memphis decided not to consider further the plans of a tour through Arkansas, as outlined by C. W. Watson, of the farm bureau. This decision was reached at a meeting of the Auto Truck Dealers association held at the Chamber of Commerce. Thos. H. Smart, vice-president and chairman of the show committee of the Memphis Automobile Dealers association, explained the situation in connection with the truck show at the Tri-State Fair in Memphis the last week in September and it was decided that an open air commercial car show would be held in the space adjoining the passenger car building, which will also have interesting exhibit.

PETERSON JOINS JACKSON

Jackson, Mich., Sept. 6.—Carl H. Peterson, superintendent of the axle division of the Olds Motor Works, Lansing, has severed his connection to become general superintendent of the Jackson Motors Corp.

New Records Set by Drivers at Canada's Dirt Track Races

Haugdahl Takes Mile in 1.03 and Two Miles in 2.05 Said to Be Canadian Records

TORONTO, Aug. 31—Sir Thomas Lipton deserted the yacht races at the Canadian National Exhibition to see the dirt track automobile races that served as a curtain raiser for Canada's only national motor show at Exhibition City here. He was rewarded by seeing Sig. Haugdahl with his 200 hp. Fiat take a lap of ½ mi. oval distance in 31 1/5 sec. and set a new mile and two mile Canadian record for this type of track by running them in 1.03 and 2.05 respectively. De Palma set a new Dominion national mile record on this track last year with his then world's fastest car, a twin six Packard, at 1.05 4/5.

Despite threatening weather and morning rains 25,000 people witnessed the races. There were four to seven entries in the various events. Haugdahl's time was electrically recorded and checked by six officials. The purses aggregated $7000 with special bonuses for records. Of this Haughdahl took $2750 for his Saturday records alone.

Demand is Increasing for Seven Passenger Closed Cars

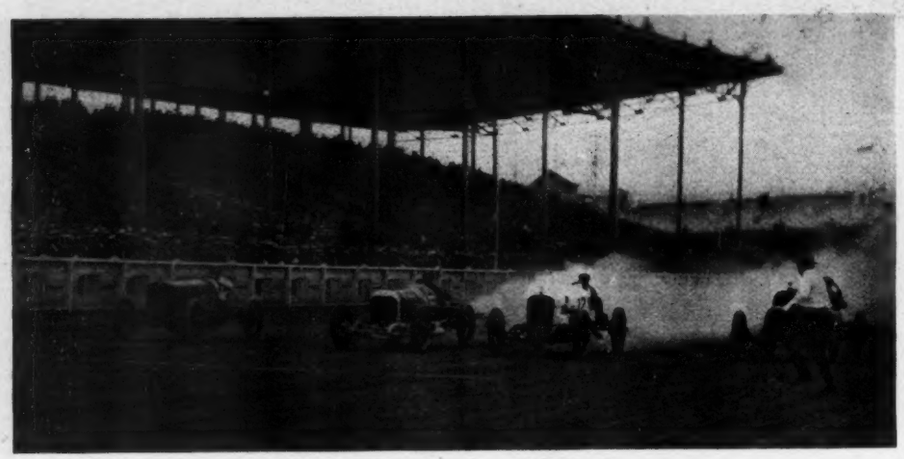
Detroit, Sept. 3.—Demand for seven passenger closed cars has increased in the last two weeks to such an extent as to cause much comment among automobile dealers and manufacturers. A few months ago, according to several well known dealers, purchasers were asking for coupes and sedans of the five passenger type. To-day, however, the demand is said to be for seven passenger types. This situation is said to be especially noticeable with distributors and dealers in the resort towns along the lake shore. It also is true to a great extent with the dealers in the inland cities.

DETROIT KNIGHT METAL ASSIGNS

Detroit, Sept. 6—Knight Metal Products Co., a subsidiary of Knight Metal Products, Ltd., of Toronto, has made an assignment to the Detroit Trust Co. for the benefit of its creditors. The concern's liabilities are approximately $350,000, with physical assets of $12,000.

ADDING TO D. T. & I. RAILROAD

Detroit, Sept. 3.—Option on a tract of land containing 483 acres has been obtained by the Ford Motor Co. as a proposed site for additional freight terminals for the D. T. & I. railroad. The tract lies northeast of the village of Flat Rock and a portion of it is adjacent to the present terminal. It is expected that a line will be run from the property acquired to the Ecorse yards of the tracks of the Pennsylvania system may be used as the connection.



Records Broken at Canadian Meet

The start of the first race of the meet on the Exhibition Oval, Toronto, that served as a curtain raiser for the Canadian National Exhibition, and Canada's only National Motor Show. Eight of the world's leading dirt track drivers completed and new records were hung up. This particular race was won by Louis Disbrow in an Essex

Files Attachment Suit Against Financing Companies Promoter

Alleged Breach of Contract to Further Clearing House for Foreign Credits Charged

NEW YORK, Sept. 7—Fresh trouble has developed here for Henry V. Greene of Boston, head of the H. V. Greene Co. of Boston and promoter of automobile financing companies which were hard hit by the bankruptcy of the Massachusetts Motor Co., Inc. It came in the form of an attachment for $505,000 filed against Greene and the Greene company by Mark O. Prentiss of this city for alleged breach of contract to promote the United States Clearing House of Foreign Credits, Inc., which Prentiss planned to organize as an international credit rating bureau. The attachment was served on all the New York offices of the defendant and on its branch in Syracuse.

Two of Greene's Boston companies, the Mutual Finance Corp. and the Commercial Finance Corp., have been taken out of his hands by stockholders' committees because of heavy losses suffered in connection with the failure of Massachusetts Motors. The exact financial situation of these companies has not yet been determined.

Boston, Sept. 7—Soon after bankruptcy proceedings were begun here against the Massachusetts Motors Co., Inc., with the request that a receiver be appointed, a special committee representing the stockholders of the Mutual Finance Corp. and the Commercial Finance Corp. made public a report to the stockholders in which it was stated that "the Commercial Finance Corp. has been subjected to a considerable loss by the bankruptcy of the Massachusetts Motors Co."

The stockholders committee found "especially in the case of the Commercial Finance Corp. that one of the companies to whom they had loaned considerable money, the Massachusetts Motors, had sold a large number of cars without applying the purchase price against the note which the car secured." A statement issued by John H. Sherburne, counsel for the two finance companies, said that while they had lost heavily he did not believe they were insolvent.

The Motors company is an association of New England automobile dealers whose retail sales on credit were financed largely by the financing companies.

Checks to Winners in Elgin Road Race Are Distributed

Chicago, Sept. 7—Checks to the drivers in the eighth annual Elgin road race which was run on Aug. 28 have been handed over by Charles M. Hayes, president of the Chicago Motor Club under whose auspices the race was run. Ralph De Palma took the lion's share of the prize money, getting one check for $6000 for first place and another for $3000 as a reward for leading at the end of each of the 30 laps which constituted the race. Fred Duesenberg was given a check for $5000 representing his winnings for second, third and fifth places, won respectively by Tommy Milton, Jimmy Murphy and Eddie O'Donnel. Louis Chevrolet got $1000 for Ralph Mulford's fourth place and Percy Ford and Eddie Hearne received $300 and $200 respectively for sixth and seventh.

KEEPING MOTOR TRUCKS LOADED

London, Aug. 16—The Automobile Association has prepared a map showing the location of six hundred agents throughout the country who will register the local requirements of manufacturers and traders in regard to return loads for their commercial motor vehicles.

Goods Roads Prove Profitable To Michigan, Governor Shows

Urges Continuance of Program to Bring About Greater Results—Trucks Help State

LANSING, Sept. 3—The advantage of the good roads system in Michigan was pointed by Gov. Sleeper in an address that featured the meeting of the State Good Roads convention here, when the Governor declared, "Michigan should be and rapidly was becoming the playground of America in the Summer and Fall just as Florida is in the winter." He told the delegates that Florida reaps an annual finance harvest of more than $500,000,000, and declares a conservative estimate of Michigan's annual share from the tourist business would reach close to $150,000,000.

"Aside from tourist business," Gov. Sleeper said, "Michigan now leads the world in the manufacture of automobiles and that makes necessary a continued highway improvement." He stressed the increasing demand for the truck for transportation and declared they would become an increasingly important factor in relieving rail congestion during the next year.

Trucks Do Big Work

A fine example of the manner in which the truck is relieving transportation the Governor said is shown in the handling of Michigan's farm produce this year. He said production was greater than in any year in the state's history and but for the aid of the truck much of it would have had to rot in the fields.

The highway commissioner, Frank F. Rogers, told the delegates Michigan had pulled herself out of the mud with the bond issue of $50,000,000 to be spent at the rate of $5,000,000 yearly for good road improvements. Mr. Rogers said the construction cost during the last year had exceeded $9,000,000 but urged that inasmuch as one-tenth of the state's total road mileage had been improved and inasmuch as many other contracts had been let increasing this materially, Michigan was reaping the fruits of a valuable investment.

John Tainsh Successor to R. C. Rueschaw at Mitchell Motors

Racine, Wis., Sept. 7—As a result of action taken at a recent meeting of the board of directors of the Mitchell Motors Co., Racine, John Tainsh has been placed in executive charge of Mitchell sales, succeeding R. C. Rueschaw.

Mr. Tainsh has been sales manager of the Mitchell company during the past four years and his successful conduct of the company's business with distributors and dealers has earned him this well deserved promotion which will further co-ordinate the co-operative relationship between the Mitchell distributors, dealers and factory.

Oil Production Has Small Lead on Consumption in This Country

7,568,848 Barrels of Oil Produced in 1919 or 50 Barrels Per Car

CHICAGO, Sept. 4—Oil production is keeping ahead of consumption in this country, according to figures presented by R. L. Welch, secretary of the National Petroleum Institute, in a paper read at the Thirteenth Annual Convention of the National Gas Engine association, held Sept. 1, 2 and 3 at the Congress Hotel. According to Mr. Welch the latest figures compiled this month show that we are producing oil at the rate of 453,000,000 barrels and using it at the rate of 437,000,000 barrels. In 1911 we produced 700,000 barrels of oil or 315 barrels per car. In 1919 we produced 7,568,848 barrels of oil or 50 barrels per car. The increase in car production has been 979 per cent since 1911 while the increase in oil production has been but 71 per cent.

TRACTOR DISPLAY FOR PEORIA

Peoria, Ill.—Sept. 7.—The tenth annual display of the National Implement and Power Farming Vehicle Show will open here September 17 and continue nine days. In addition to the display of tractors and all kinds of agricultural implements there will be daily plowing and other field exhibitions. Nearly two hundred manufacturers have engaged space for their exhibits and this year's event promises to be upon a greater scale and with larger crowds than those of any preceding year.

ALLEN MOTORS REGAINING

Columbus, O., Aug. 29—Substantial progress is being made in working out a plan which contemplates lifting the receivership of the Allen Motor Co. and it is probable application soon will be made to the courts to take this action. It has been demonstrated that the company can easily be made solvent if funds can be provided to permit a continuance of operations. The outlook is regarded as much more hopeful than it was a few weeks ago.

ALCOHOL AS GAS SUBSTITUTE

Washington, Sept. 7—Depletion in the stocks of industrial alcohol has been reported by the Bureau of Internal Revenue though there has been no appreciable decline in the volume of production. A movement is under way to obtain modification of the Volstead act or enforcement regulations which will permit the manufacturers to start operations on a larger scale. Failure of gasoline producers to keep abreast of domestic consumption is taken as an indication that alcohol will shortly become a popular substitute as a motor fuel, the extent of its usage depending almost wholly upon adjustments to automotive equipment.

Tommy Milton Wins Uniontown Race with Jimmy Murphy 2nd

Uniontown, Sept. 7—The 225 mi. automobile race here yesterday was won by Tommy Milton in a Duesenberg in 2:20:24, an average of 96 m.p.h.. Eddie Hearne in a Revere came in third in 2:24:34, an average of 93.9 m.p.h.

Milton regained and lost the lead four times. In the 50th lap Murphy was leading followed by Milton with Eddie O'Donnell in a Dusenberg, third. In the 100th lap Milton regained the lead, Murphy following less than ten car lengths behind, and O'Donnell third.

Waldo Stern and Gaston Chevrolet stopped for wheels in the 118th lap due to Chevrolet's striking the rear of Sterns' car while attempting to pass on the east curve.

How the Orchard Tractor is Performing in California

(Concluded from page 16.)

The spacing of the trees is such that the tractor must make two trips between two adjacent rows, and sometimes three. If it were possible to use disks as large as 10 or 12 ft., two trips would be all that are necessary, but this would require a tractor so large that it would not be flexible and mobile in handling.

Mobility is highly desirable. In order to avoid standpipes, to turn quickly, and to dodge readily, the tractor must be light for its power, have a very short turning radius, and answer quickly and surely to the steering gear. Some of the tractors which are being adapted to orchard work are being fitted with supplementary wheel brakes so that either drive wheel may be locked, pivoting the tractor and permitting it to turn within twice its own width. This quick turning is facilitated by fitting the front heels with a sand cleat, which frequently is as deep as 5 in. This holds firmly in the loose soil and forces the machine to obey the turning impulse without slipping.

Flexible Drawbar.

To insure traction in the light soil, which is characteristic of the orchards, the drive wheels must be fitted with special lugs or grousers. These may be of the spade type or the angle iron type, but they must be from 5 to 6 in. in depth and mostly are so angled that they enter and leave the ground at 30 deg. This is necessary because at that angle they are practically self-cleaning and do not carry dirt to the top of the wheel to be dumped there and thus to complicate the dust problem.

The drawbar must be swinging and flexible. Some of the tractors which first came to California had rigid drawbar hitches. Experience soon established the fact that these would not do in the orchard. At times it was necessary to turn the tractor at right angles or more to the tool it was pulling, and a drawbar with a wide and free swing was needed. Some of the dealers have designed and are manufacturing special drawbars which they are putting on the tractors which come normally with rigid hitch. In fact, it is common custom in California for the dealers to put all special equipment onto the machines they sell. This includes lugs, hitches, air cleaners and shields. The matter of shields is important. Some of the steel tractors which work in the orchard are so completely shielded and fendered that they look like miniature submarines. The Avery is a case in point. It is essential that the tractor be as free as possible from projections of any kind which may have a tendency to catch in the branches, otherwise they may not only injure the trees, but also allow limbs to fly back and injure the operator.

The dusty condition in which the orchard tractor works necessitates a specialized air cleaner. The washer type, which comes as standard equipment with the Cletrac, the Fordson and the Case, is quite efficient. The Fageol has a specialized cleaner and on some of the other tractors the standard air cleaner must be replaced by something like the Pamona cleaner, which was described some time ago in MOTOR AGE.

Some uncertainty exists at the present time as to the power the final orchard tractor should have. Some orchardists think the tractor should pull 3—12-in. bottoms. Some of the machines now commonly in use will do this; others will not. Opinion seems to be drifting in the direction of a need for a tractor with considerable reserve power, and this is being met by some of the manufacturers who are increasing the cylinder bore by ¼ in. What the outcome of this will be only time will tell.

Orchards All Over the Country.

Mention has been made of the fact that up to the time of the demand for a specialized orchard tractor which manifested itself in California, it had apparently not occurred to anyone that such a machine was needed anywhere. This despite the fact that there are orchard tracts in nearly every state in the Union.

Now that the necessities of the California orchardists are finding expression in the evolution of a specialized orchard tractor, manufacturers are beginning to vision the possibilities of a trade for such a machine wherever fruit trees or vineyards grow.

When this happens the orchard tractor will be ready. The condition in the Pacific Coast orchards are so extreme and severe that it is certain that the tractor which can meet these conditions successfully will be able to negotiate orchard conditions anywhere else in the United States.

Bright Future Predicted in Devonian Shale Development

Professor Sees It as Source of Supply for Fuel and Lubricating Oils

NEW ALBANY, Ind., Sept. 3.—Through development of the Devonian shale with its crude oil content and valuable by-products, the Falls cities of the Ohio possess a means of becoming one of the leading industrial centers of the country, according to Prof. H. A. Buerk, superintendent of schools here. In an address before the New Albany Chamber of Commerce he related the history of the shale and predicted that the future supply of gasoline and lubricating oils will be obtained from it.

He exhibited an ounce of the oil which he said he had distilled from less than a pound of shale, and declared that by proper distillation about fifteen gallons can be obtained from a ton of the shale.

Formed of Fishes Ages Ago

The Devonian shale, formed of myriads of fishes which infested the Devonian seas during a prehistoric era, underlies New Albany and Jeffersonville with a thickness of 104 ft., reaching out south far into Kentucky and north almost to Indianapolis, according to the lecturer.

One of the by-products from the shale is a residue that becomes the body of Portland cement, Professor Buerk said. Distillation, he explained, results in the shale giving up hydro-carbon, some in the form of gas and some in the form of oils of varying specific gravity. From refining these crude oils, scientists are getting gasoline, kerosene, ammonia and paraffin, he declared.

FILMS FOR STUDEBAKER DEALERS

South Bend, Ind., Sept. 1.—Studebaker dealers in all parts of the country will be furnished with 500 feet of film showing views in connection with the completion of the $20,000,000 plants recently. It will take about eight minutes on the picture screen.

Vigilance of Police Cause Automobile Theft Decrease

Detroit, Sept. 3.—Vigilance of the police automobile squad, backed by the determined attitude of the new municipal court judges, rapidly is decreasing the number of automobile thefts in Detroit. The months of May, June and July show a decrease of 38 per cent as against the same months last year. During the period 947 cars were stolen in contrast with 1136 in the same months in 1919. This in face of the fact that the number of automobiles in use has increased about 25 per cent. For the last three months prisoners have been sent to the penitentiary with a regularity discouraging to the gangs which have been preying on automobile owners.

Another factor that has entered largely in the success of the campaign has been the newspaper publicity given the new court by the Detroit Automobile club. The club, encouraged by the results of the last three months, is launching a vigorous campaign which it is hoped will eliminate entirely the automobile thief. Widespread publicity is the plan decided upon by the automobile club with warnings to prospective purchasers against buying stolen cars, daily bulletins to sheriffs and police chiefs and prosecuting attorneys throughout the state.

More than ten thousand window posters have been ordered by the club to be put up in conspicuous places in all cities warning prospective buyers against the purchase of stolen cars.

Why the 183 Cu. In. Engine Made Good

(Concluded from page 11.)

From this it would appear that the best place to close the intake valve would be at the bottom dead center but if this was done no advantage would be gained from the fact that the gases themselves contained a large inertia force due to their high velocity. If water was flowing through a pipe at an extremely high speed and a valve in the pipe was closed instantaneously a water hammer would result that would undoubtedly break the pipe.

The possibility of bursting any of the engine parts from gas inertia is remote but the comparison makes it clear that there is some energy which might be made use of. As the piston starts on its upward stroke it will naturally expel the charge which has already been drawn in but the incoming gases having sufficient force persist on rushing into the cylinder until the piston force is balanced. At this position the intake valve should be closed. The higher the engine speed the later will be the closing position.

Exhaust valves open around 45 deg. before bottom dead center at which point it is found further power from the gases cannot be obtained. Lower speed engines make use of much of the remaining power and on these engines the exhaust valve would open much closer to bottom dead center.

The closing position of the exhaust valve is determined very much in the manner of that used for the intake closing position. Except that further aid is given the exit of the exhaust gases by the incoming intake gases, it will be noted on the diagram that on the three engines the intake opens before the exhaust valve closes. In this manner the intake gases coming in a high velocity at a time when the exhaust gases are considerably slowed down a forceful scavenging action is obtained.

Such other considerations as the weight of the moving parts is highly important. We know of one case where the installation of valves with hollow stems in place of the solid stem valves increased a racing car's speed 8 m.p.h. To decrease the weight of the valve head some engines use a tulip type valve such as is shown in the illustration. Pistons are made extremely light and in most race cars but two rings per piston are used. Connecting rods are also made very light.

The next consideration is the reduction of friction. To the attainment of this end every moving bearing in a race car is fitted with the greatest of care. Ball bearings are used very generously. In the engine shown, twelve sets of ball bearings are used. The illustration of the crankshaft shows how the bearings are installed and lubricated.

The wheel bearings are also generously fitted with ball bearings. So thoroughly and completely is the friction removed from the chassis parts on these race jobs that by resting one's hand on the body and giving a gentle push, the car will begin to roll. Appreciating the extent to which friction has been reduced in the chassis, it is evident that an engine turning over 3500 r.p.m. and developing about 90 hp. can easily push the car at the speeds which have been attained this season.

Dealers in Commercial Papers Show Use of Cars in Business

State That Nearly All Passenger Automobiles Sold Were Employed for This Purpose

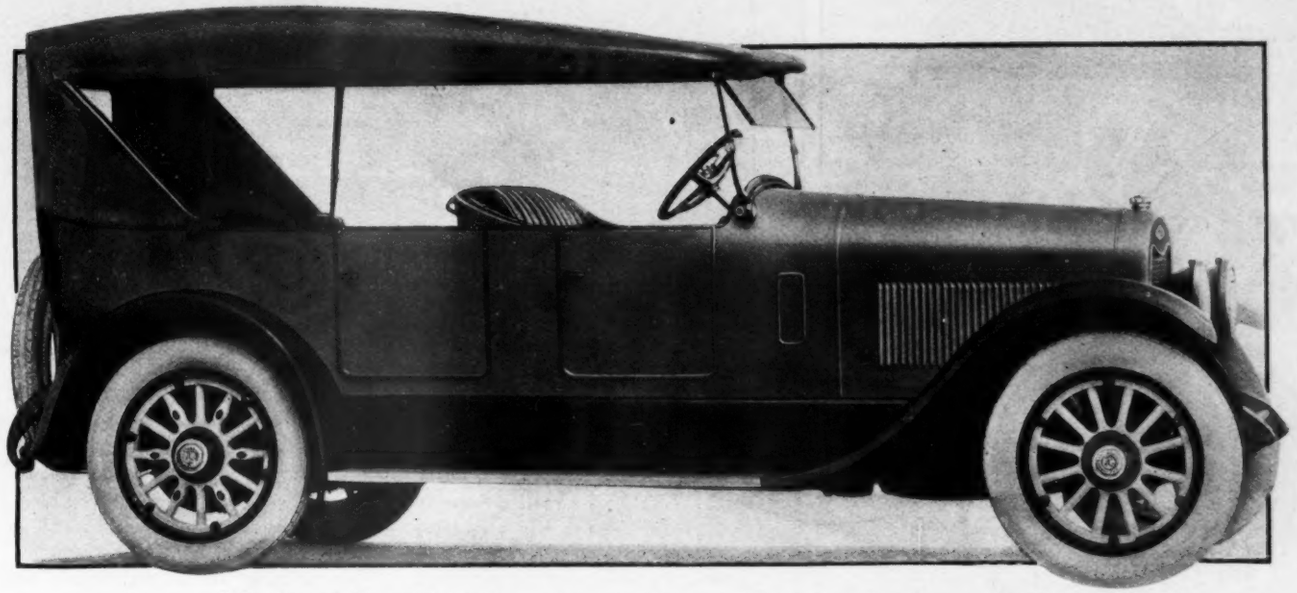
SAN FRANCISCO, Sept. 3—Further evidence of the undeniable fact that passenger automobiles are essential is presented by the L. F. Weaver Co., dealers in commercial paper, in data covering 500 conditional sales contracts made by country dealers and 75 made by San Francisco dealers.

These figures show that of the 500 country contracts, 190 were with farmers who employ their cars for the usual farm and family use; 59 were with country merchants, 46 of whom used their cars for business; 25 were with contractors, all but two of whom used their machines for business purposes; 22 were with professional men, of whom 16 used automobiles for business; 31 with bookkeepers, clerks, salesmen and stenographers, 18 of whom used cars for business; 24 were mine and ranch foremen, of whom 13 used cars for business; 99 with laborers, all but 16 for business.

Essential Transportation

The same general proportions were carried out in the city contracts, nearly half of which were with merchants, of whom nearly three-fourths used the cars for business.

The Weaver Co. points out that one of the reasons for the false assumption by bankers that automobiles are luxuries is that most of them have forgotten that not so long ago the purchase of horses, wagons, carriages and accessories was financed on time much as automobiles are now and the ground that they were an essential means of transportation.



Side view of the new Lincoln touring car, which up to this time has been shrouded in considerable mystery

Lincoln Eight a Conservative Design

Unusual Range of Performance—Speed Extremes on High Gear From 3 to 73 Miles Per Hour—Manufacture and Workmanship Given Much Thought

ON Aug. 31, the first twenty of the much heralded Lincolns were completed. This is an eight-cylinder product having a wheelbase of 130 in. The engine is of the familiar V-type construction having a bore and stroke of 3⅜ by 5 in. Seven body styles are supplied on the one chassis and an eighth the Suburban limousine is mounted on a slightly longer wheelbase. The 7-passenger touring car lists at $4600, 5-passenger touring car $4600, Roadster, 3-passenger, $4600; Coupe 4-passenger, $5750; Town brougham, 5-passenger $6250; Sedan 5-passenger $6000; Suburban limousine, 7-passenger $6600; Town car, 7-passenger, $6600; Chassis, $4000.

Specifications of the Lincoln Eight

Engine—Eight-cylinder V type
Bore and Stroke—3⅜ in. by 5 in.
Lubrication—Pressure feed
Electrical Equipment — Delco
Clutch—Dry plate type, 15 disks
Chassis Lubrication—Alemite
Wheelbase—130 in.
Springs—Semi-elliptic

Semi-Elliptic Springs

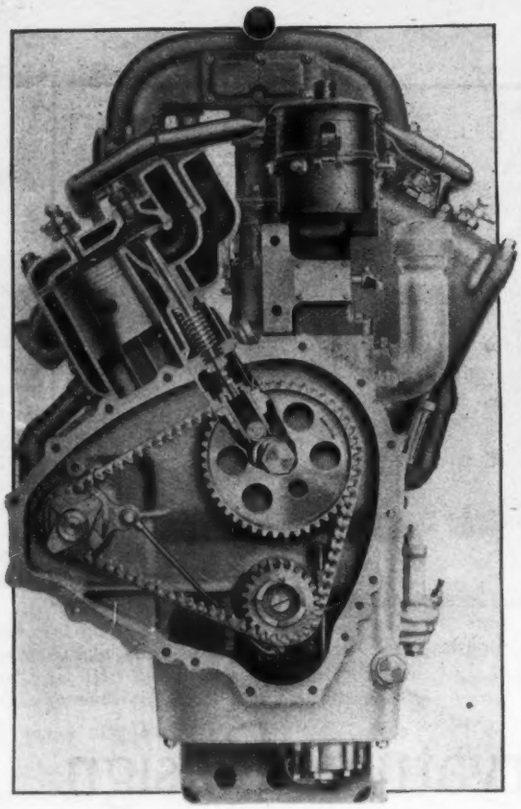
The power plant, multiple disk dry-plate clutch, and three-speed transmission are in unit. The drive is taken through the large and rigid torque tube. Semi-elliptic spring suspension is employed throughout.

The engine cylinders are cast in blocks of four, arranged at an angle of 60 deg. with valves set at the same angle. The above mentioned cylinder proportions gives a piston displacement of 357.8 cu. in. The main structure of the engine consists of four castings. The crankcase, which is of aluminum, the two cylinder blocks and the lower old reservoir. Each block is fitted with a removable head. Seldom does one see as large a crankcase as the one employed on this engine. It is unusually rigid for it is stiffened by three bridge-like webs set transversely. Five main bearings are used and the three central bearings are carried in these transverse webs. This construction eliminates vibration to a marked degree, a Class Journal Co. representative stating that he noticed no engine vibration through the performing range of 3 to 73 m.p.h. in high gear.

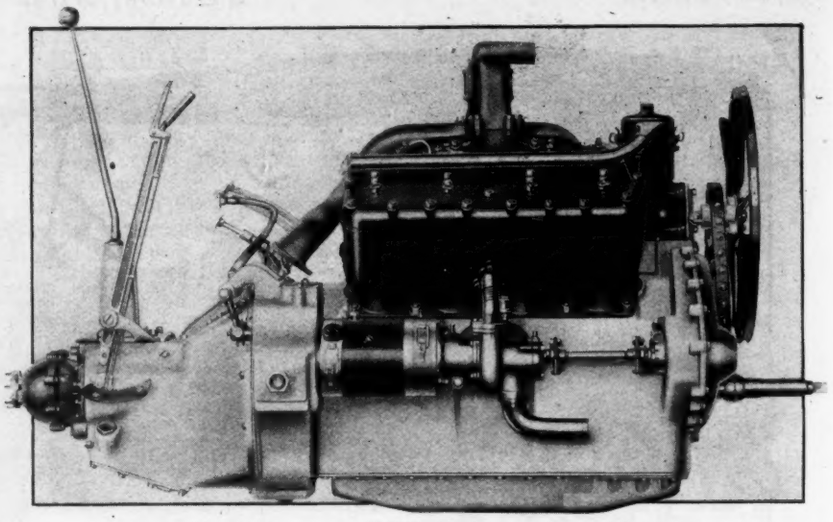
The cylinders are of gray iron and are so designed as to be interchangeable on the crankcase. Gray iron casings are also employed for the pistons; these are 3¾ in. in length and are fitted with three piston rings which are all above the wrist pin. Seamless steel tubes are used for the piston pins and these are ⅞ in. in diameter. Forged connecting rods which are machined all over make these members extremely light. The rods are 12½ in. in length. A 2 in. crank shaft with five bearings is used, the bearings being supported in the bridges previously described in connection with the crankcase. All bearings are bronze backed and babbit lined. A silent chain serves for valve drive. These give a triangular chain layout passing around the crankcase drive gear, the camshaft and the pump shaft gears.

Camshaft Drilled Entire Length

A hollow drop forged camshaft is used which is gun drilled for its entire length. This construction permits of positively lubricated camshaft bearings and gives a light weight shaft. A camshaft is mounted on six bronze backed bearings and is so designed that it can be withdrawn through the timing gear housing. No intermediate rockers are used to drive the valves from the shaft, this being accomplished by direct engagement with the valve tappet. These are hollow and are operated by roller followers. Because but one camshaft is used it follows that the valves are on the inside of the blocks.



End elevation of the Lincoln eight-cylinder engine



The Lincoln power plant viewed from the right side, showing the clean layout of the engine and gearset

This serves to give a large cooling surface on the valve stem.

Lubrication is through pressure feed, the oil pump being of the gear type driven by spiral gears from the camshaft. The pressure range on the oil is from 5 to 25 lbs. per square inch. The path of the oil is as follows: From the pump it passes through a relief valve from thence in main lead which traverses the entire length of the crankcase. This lead serves as a distributing branch and from here the oil is fed to each of the five main crankshaft bearings. The hollow passages in the shaft conduct the oil to the connecting-rod bearings. From the end of the crankcase another lead passes to the rear end of the camshaft which it will be remembered is hollow. An independent lead also passes to the timing chain, entering it at the pump shaft sprocket, giving positive lubrication to this drive.

Pressure Gage on Dash

There is a pressure gage mounted on the dash and also an oil level indicator operated from a float in the crankcase and brought up to a sufficient height to be readily legible on lifting the engine hood. The flow through the bearings is regulated by a ball pressure relief valve which is mounted on the front end of the crankcase and is readily accessible for adjustment. The ball check is spring controlled, adjustment of the pressure relief being affected by increasing or decreasing the pressure on the springs by turning the adjusting screw.

The cooling system has been very completely worked out. It has a capacity of 8 gal., the water being circulated by a centrifugal pump mounted on the right side of the crankcase. The water is equally distributed to both cylinder blocks, uniting and returning to the radiator through the gas intake header, which comprises three passages. The middle passage is the intake to the cylinder, the outer is for the water return and the inner one is connected direct with each exhaust manifold. The intake gases are thus heated both from the exhaust water and the exhaust gas, tending to vaporize the present low grade fuel.

The radiator is a tubular type provided with shutters. The core is separated by a separate outer casing entirely independent of water circulation and with an air space between the core and casing to preserve the finish of the radiator. The shutters are operated by a thermostat mounted in the upper radiator tank directly controlling the shutter mechanism.

Temperature Controlled

On the experimental car, in which the writer took a demonstration ride, the thermostat was set for 150 deg. The thermostat is a sylphon type, horizontally mounted, and directly linked to a vertical rod passing down the center of the radiator and connecting the shutters, which rotate on rods pivoting in the supports at the side of the radiator. Thus, the shutters respond immediately to changes in temperature of the water passing through the cooling system.

The water in this system circulates freely at all times and is not by-passed, but passes directly through the radiator, the temperature being controlled by the shutters. There is a condenser tank in connection with the radiator overflow pipe, which prevents loss of cooling liquid by evaporation. Upon cooling of the radiator, the condensed liquid is drawn back, this being a particularly valuable point when using alcohol or other expensive anti-freeze solutions.

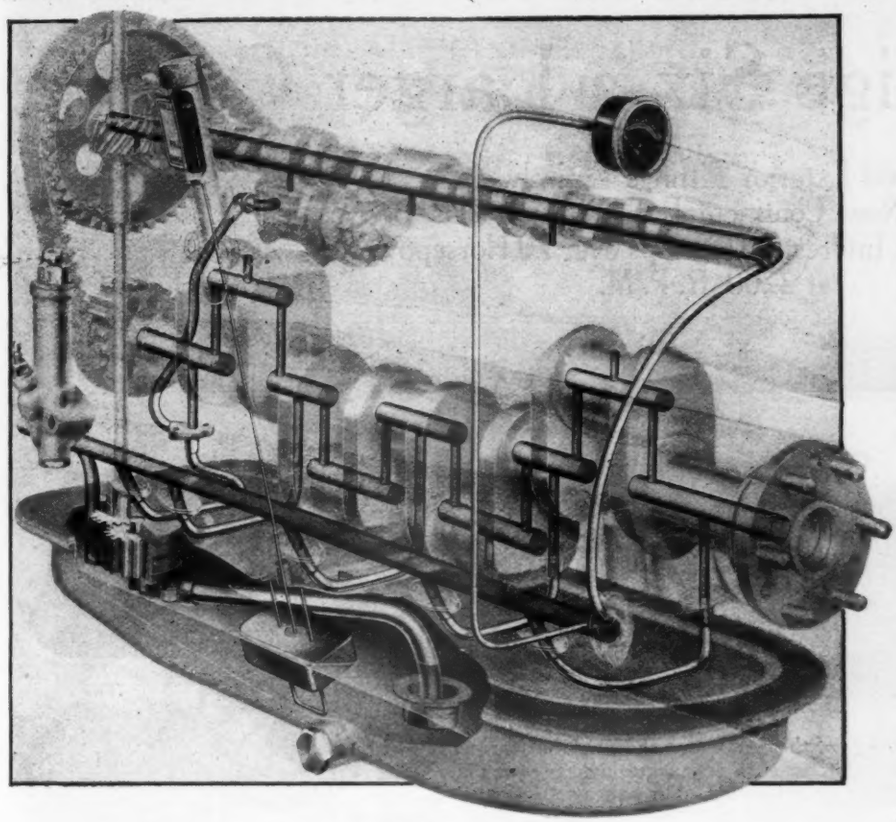
The fan is a six-blade, ball bearing type, mounted on an adjustable bracket. It is driven by a linked belt from the fan pulley which is mounted on the end of the camshaft. The electrical system is a Delco installation, the starter generator being driven off the pump shaft. The distributer is mounted on the front end of the engine crankcase, containing an automatic spark advance with manual control for extreme speed regulations. The starter generator is a six-volt, single unit, with mechanically operated gear drive to the flywheel for cranking. The current is regulated by the third brush system and uses the grounded return wiring. The headlights are equipped with tilting reflectors controlled from the driver's seat. Circuit breakers are employed instead of fuses, the lights being in circuit with the vibrating type of breakers.

Fifteen Disks in Clutch

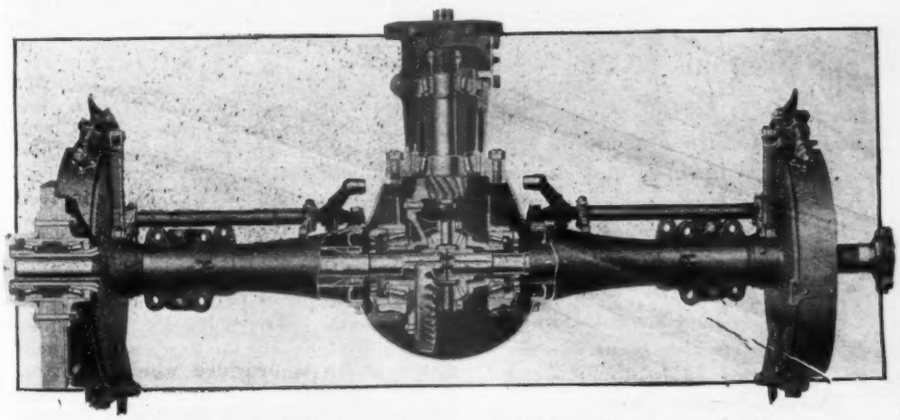
The clutch is a dry plate type with fifteen disks, seven driving and eight driven. It is extremely adjustable for wear and is completely enclosed within an aluminum-alloy housing which forms a continuation of the crankcase, making up the unit powerplant. The disks are alternately faced with asbestos woven fabric. The transmission gearset is a three-speed, selective type, the main shaft being mounted on annular ball bearings of large diameter.

The gearbox is of conventional design with exceptionally short, stiff shafts, the sliding gears being mounted on splines. The universal joint located at the front end of the propeller shaft is in communication with the gearbox, thus assuring lubrication for this important joint through which the drive is transmitted. The torque tube takes all of the driving thrust which is transmitted through this ball joint. Increased rigidity in the driving unit is secured by a triangular radius rod layout connecting the outer ends of the rear axle housing with the torque tube at a point just behind the ball joint.

The rear axle is a spiral bevel design, mounted throughout on Timken roller bearings. The pinion shaft is carried in



Phantom view of the oiling system used on the Lincoln engine



Sectional view of the Lincoln rear axle, driven by spiral bevel gears

an adjustable carrier which permits of adjustment of the mesh between the pinion and ring gear. The ring gear is also adjustable for mesh. The axle is full floating type with the weight carried on the pressed steel housing. The wheelbase is 130 in. for all cars except the Suburban limousine, which has a 136 in. wheelbase.

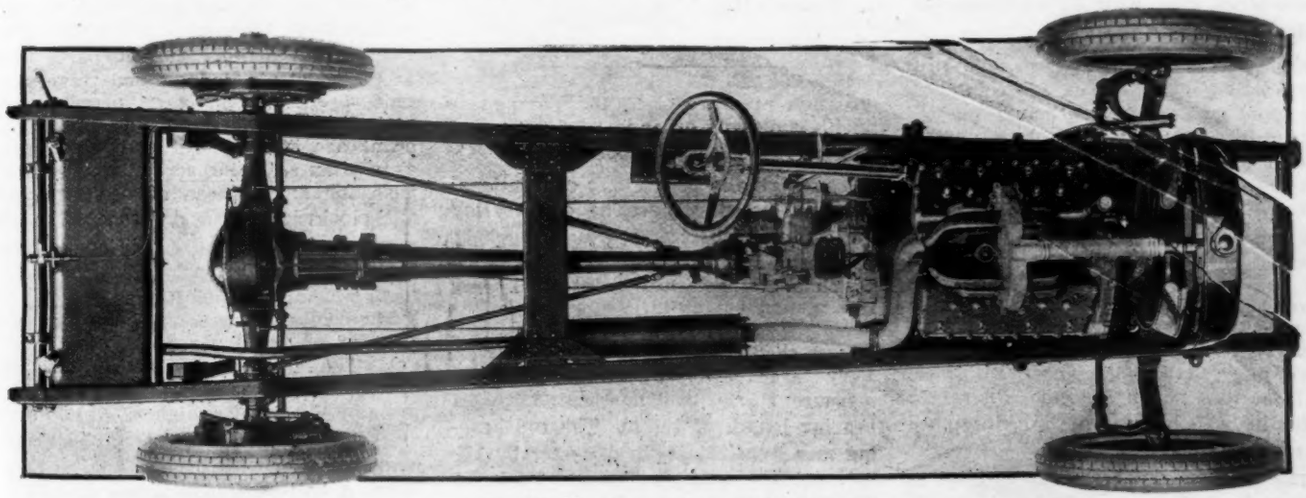
Alemite Chassis Lubrication

The power pressure pump is driven from the transmission. The tire size is 33 by 5 in., cord tires being standard equipment. The chassis presents a very accessible layout, the grease cups having been abandoned in favor of the Alemite system, and the brake and other adjustments are easily made. The clutch pedal is adjustable by taking up on an easily accessible screw closely adjacent to the pedal mounting.

The body styles might be described as conservative without radical innovations having a characteristic straightline appearance. The standard finish of the panels is a very dark blue, almost a blue black, which is designated as Lincoln blue. A belt line stripe is used to match the interior finish. The radiator, running gear, hood, fenders, etc., are black enamel. The wheels are of the Lincoln blue with striping to match the interior finish.

The interior work on the car is carried out in very tasteful detail, an example being the instrument board. The layout of the instruments is symmetrically balanced, having the speedometer and clock layout similar in size to the switch layout. Between these two are mounted the oil pressure gage and ammeter.

These cars are now coming through in regular production. Several hundred will probably be made in September, although no stated schedule has been announced. It was planned originally to build 6000 of these cars the first year but due to material shortage, transportation delays and other serious handicaps which the whole industry has been experiencing, a revision downward will have to be made.



Airplane chassis view of the new Lincoln, showing the sturdy frame construction and layout of drive members

New Paige Six a Larger Car

Body Lines and Exterior Fittings Entirely New. Engine Is the New Continental 8-A Which Has Been Awaited With Interest. Develops over 70 Horsepower at 2200 R. P. M.

Side view of the new Paige showing the marked straight line effects. The windshield is equipped with side glasses giving an upright post for better attachment of the side curtains

The radiator is high and narrow

A NEW model has been announced by the Paige company of Detroit, a big six of larger proportions than the model it supplants, which in connection with the lighter six which is continued the same constitutes the Paige line for 1921. The new model secures its name from its 6-cylinder engine which develops 66 hp., hence Six-66.

The most important feature in connection with the chassis of the new car is the engine, a Continental product bearing the model number 8A which has long been awaited by the automotive world. This engine is very similar to the Continental 7A model which was announced some time ago, except that it is of larger bore and stroke measuring 3¾ by 5 in. On this engine the cylinders are of the mono-block type with a removable cylinder head.

Engine Has Abundant Power

Three-point suspension is employed, the front supporting arm being mounted on the front cross-member of the chassis and the third point suspension members are cast integral with the gear case cover. An aluminum crankcase is separate from the block and the oil pan is pressed steel. Thus the engine is built up of three sections, the block, the crankcase and the lower pan. From a power standpoint this engine displays extremely good characteristics, its 3¾-in. bore gives it a horsepower rating of 33.75 at 1000 piston feet per minute. In actuality 43.5 horsepower are developed at rated speed.

The peak of this engine is reached at 2200 r.p.m. where over 70 hp. is developed. A clearance volume, 23 per cent of the piston displacement gives a compression pressure of 65 lbs. per square inch. The firing order is 1-5-3-6-2-4, and the engine weighs 675 lbs.

Specifications of the New Paige

Engine—Continental Model 8-A 3¾ by 5 in. bore and stroke.
N. A. C. C. Horsepower Rating 33.75.
Lubrication—Force Feed—Gear driven Oil Pump.
Cooling—Forced Circulation.
Ignition—Atwater Kent.
Starting and Lighting—Gray & Davis. Bendix Drive.
Clutch—Borg & Beck.
Drive—Hotchkiss.

The engine is built along conventional L-head lines incorporating a 4-bearing hollow crankshaft, 4-bearing camshaft, pressure lubrication, forced cooling, which is thermostatically controlled. Grey iron pistons having three rings per cylinder are used. The connecting rods are of I-beam section and are machined all over. Very large piston pins are used with measure 1⅛ in. in diameter and have a bearing length of 1¾ in. The rod bearing measures 2⅜ in. in diameter by 1⅞ in. long. All main bearings are 2⅜ in. in diameter and measure in length from front to rear, respectively, 2 13/32, 1¾, 1¾, 3 1/16. Helical timing gears drive the camshaft. Its four bearings measure from front to rear, respectively, 2 5/16 by 1 15/16, 2 9/32 by 1 1/16, 2¼ by 1 1/16, and 2 7/32 by 1⅝.

The valves which are on the right side of the engine have nickel-steel heads welded to carbon steel stems, the valve mechanism being fully enclosed and splash lubricated. A 1 15/16 in. is used, having a throat diameter of 1 13/16 in. Forty-five degree seat angles are employed with a valve lift of 5/16 in.

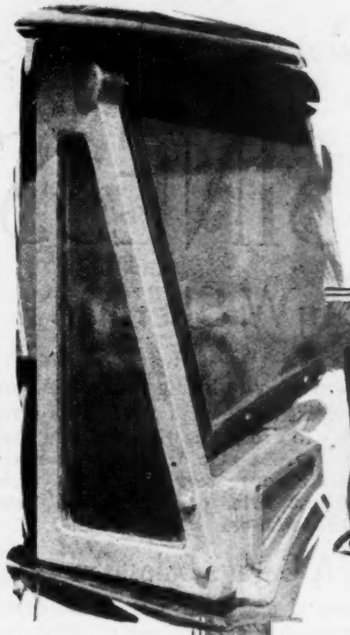
One feature which distinguishes the Continental 8A from the 9N is the lubrication system. On the new engine a gear type pump is provided which is externally mounted and provides pressure feed through the main bearings through the hollow shaft, and also to the connecting rod bearings. A pressure lead also lubricates the timing gears. Splash feed lubricated the other moving parts such as the wrist pin, tappets and valve stem guides. All accessible oil pressure adjustment is located on the top of the crankcase at the front end which consists of an adjusting screw turned clockwise for an increase of pressure and anti-clockwise for a decrease. The oil pressure for average conditions should be 15 lbs. at 1000 r.p.m.

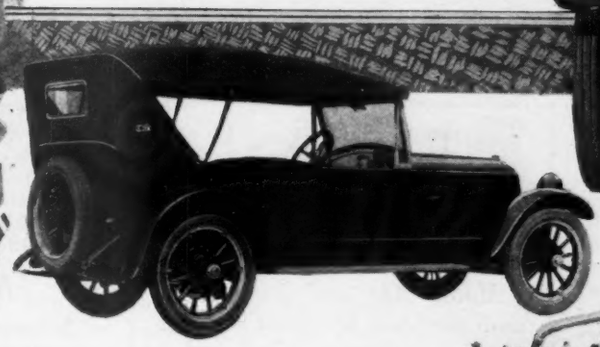
Radiator Narrow and Higher

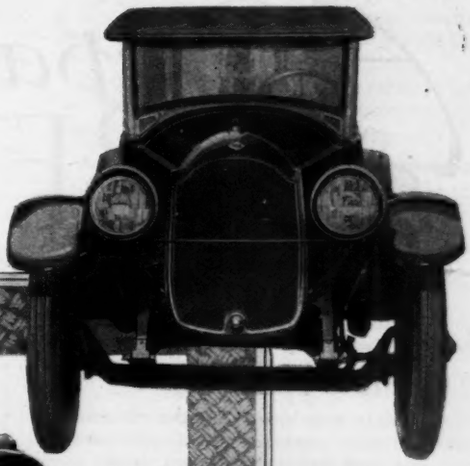
The cooling capacity of the engine and radiator on the new model Paige is 5¾ gal. The V-type radiator characteristic of the Paige car is continued but the radiator is slightly higher, which provides greater cooling capacity, and harmonizes better with the re-designed body lines. A ball bearing type fan is used of four blades driven by a flat belt provided with a quick adjustment feature.

(*Concluded on page 57*)

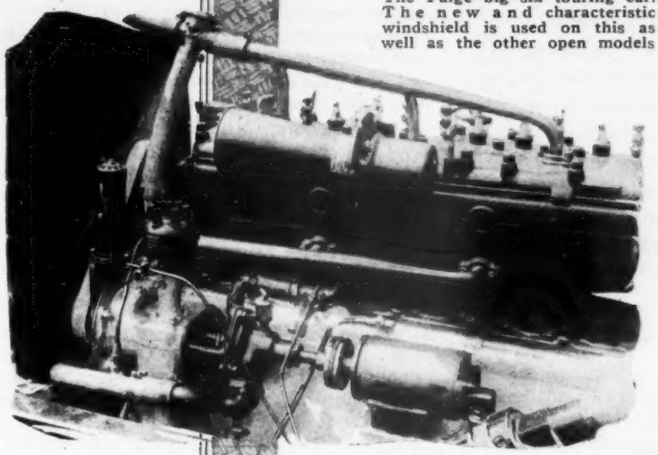
Various Angles of the New Paige



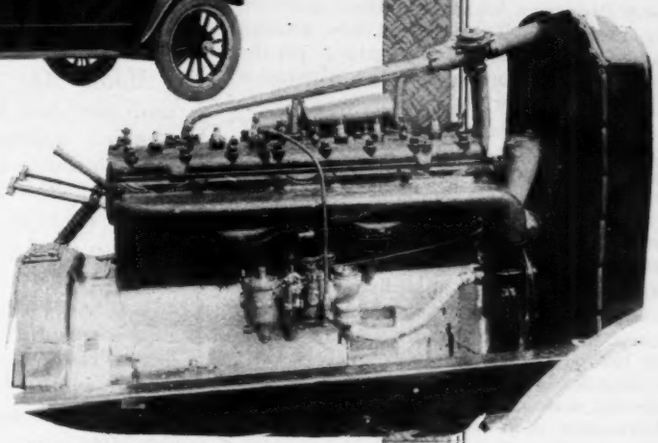




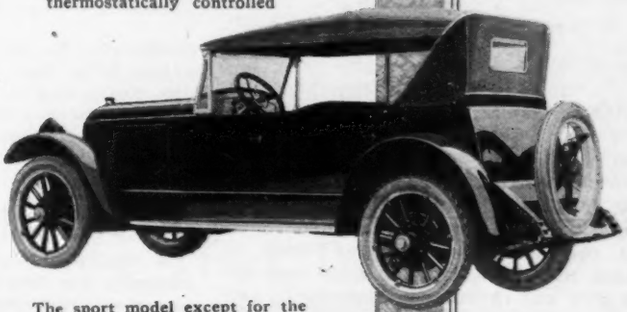
The Paige big six touring car. The new and characteristic windshield is used on this as well as the other open models



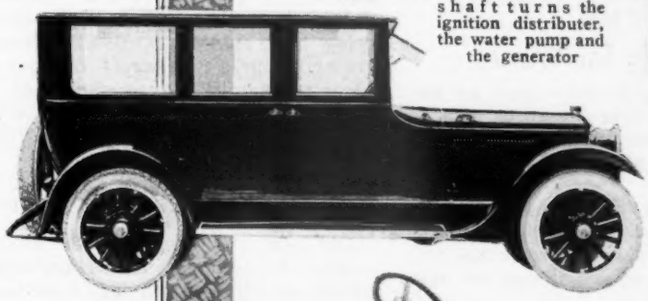
The left hand side of the new engine. The auxiliary drive shaft turns the ignition distributer, the water pump and the generator

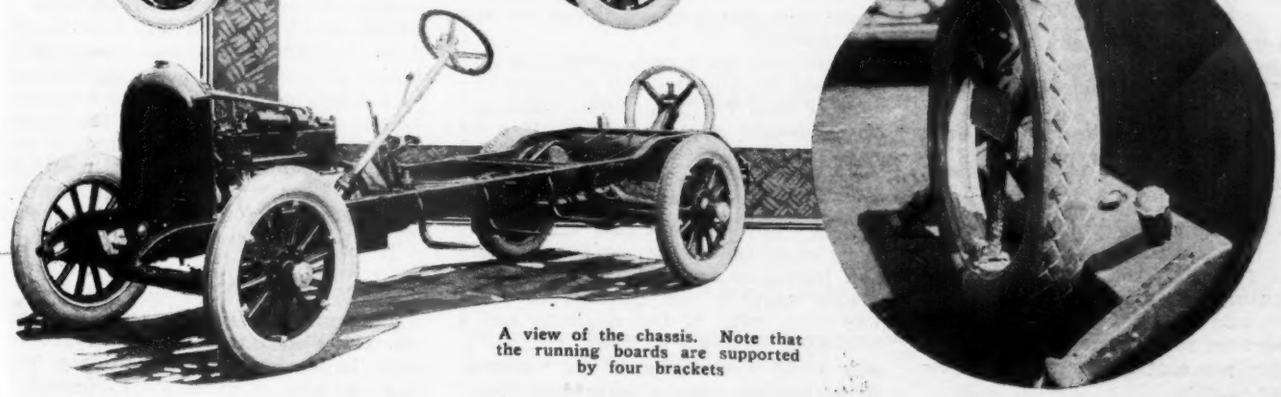


The right or carbureter side of the Continental 8-A engine. Note that the cooling system is thermostatically controlled



The sport model except for the different windshield resembles its predecessor





A view of the chassis. Note that the running boards are supported by four brackets

A Department of BETTER BUSINESS

Conducted by Ray W. Sherman

Make Them Talk

Probably the most effective means of getting the attention of a prospect is getting into conversation on some subject in which he, rather than yourself, is interested. The story of how a claim agent for a large corporation in the middle west worked the plan illustrates the idea very well.

This claim agent had been endeavoring to get the claim agent of a railway company to allow certain claims for damages. Time after time the corporation representative had gone to call on the railroad man and time after time he had been turned down without even seeing the claim agent; finally he secured an audience and one by one the railway claim agents turned down all the claims of the corporation man.

Finally the man with the claims got up and said: "Well I don't care whether I get any of these claims O.K'd or not the way I am feeling to-day."

"What is the matter?" said the railway claim clerk.

"Rheumatism," said the corporation man.

With that the railway claim agent began a dissertation on rheumatism. It lasted for hours. He took the corporation representative to lunch and kept him until 3 in the afternoon and approved all of his claims.

It is needless to add that the representative of the corporation had found out previously that the one thing in which the railroad claim agent was interested was rheumatism, because it had been one of his greatest afflictions for many years. It does not necessarily follow that you have to have rheumatism to be an automobile salesman.

Your Insurance?

Have you lately paid any attention to the insurance on your building? There is a clause in most policies which states that the amount paid on the loss shall be that percentage of the loss which the insurance bears to eighty per cent of the building.

In other words: Your building is worth $1,000. Eighty per cent of this is $800. Your insurance is $800. If you have a $500 loss you get $500. But if your insurance is only $400, which is half of $800, and your loss is $500, you get $250, because your insurance is only half of eighty per cent of the value of your building.

Perhaps you placed your insurance some years ago when your building was worth $1,000, and perhaps increasing values have made the same building today worth $2,000. The percentage relation has been considerably changed by the rise in property values. Therefore, you need more insurance if you are to be protected in case of loss.

Thanks!

From Enid, Oklahoma, comes a Better Business idea that you may be able to use. It's about a "cussing box." Try it.

Motor Age and its readers wish to thank Mr. Scott and the dealers, salesmen, and other contributors to this Department of Better Business.

An idea doesn't necessarily have to be a world beater to be good. Better Business is made up of countless "little ideas" and we would rather have little ideas than big ones. They're better in the long run.

Keep sending the ideas. For the trouble of writing them— $1.00. *Thank you.*

Get Ready for Winter

A dealer wants to know how he can increase his turnover when he has to buy cars all winter and store them, yet can't sell them. It all depends on whether he CAN sell them.

It has been demonstrated that cars CAN be sold even when the snow is deep, and on this subject MOTOR AGE will have some things to say during the next few months.

Ideas that have been used with success will be printed—AND we would like to have from YOU some of the ideas that have brought success to you. May we have them?

"None of Us Is Perfect"

Most every business man has had the experience of having good customers quit buying his goods. The wide-awake dealer makes it his business to know why they quit. If the customer has a grievance he wants to know, because it may avoid weaknesses in his business. If the customer has a legitimate "kick" Mr. Wide-awake Merchant immediately rights matters.

It doesn't pay to blame your customers if they don't agree with you. There are two sides to every question and you may be on the wrong side or perhaps you are not putting your story across the right way. Think twice or discuss the question with some one who knows.—J. H.

A Garage Salesman

In several garages a man is employed as salesman, courtesy man or whatever you choose to call him. His job is to greet every one who comes in.

He is also a salesman, and endeavors, without being too persistent, to see that all the needs of customers are supplied. He sells water, air, water for the battery, gasoline, oil, tools, tire supplies and all sorts of things. It is surprising how many things a car owner needs but doesn't think of until he is out on the road where he can't buy them.

About Your Signature

In looking over an even dozen letters received recently there were only two that had signatures that could be easily decoded. The other ten had scrawled signatures that would take considerable time and effort to decipher. This is a common fault in business correspondence so unless you sign your name clearly and write one that is easily read it is a good plan to have it typewritten below your signature. Don't let customers or business men waste valuable time decoding your signature when they don't know your name. There's no harm in typing it so it can be understood readily. —J. H.

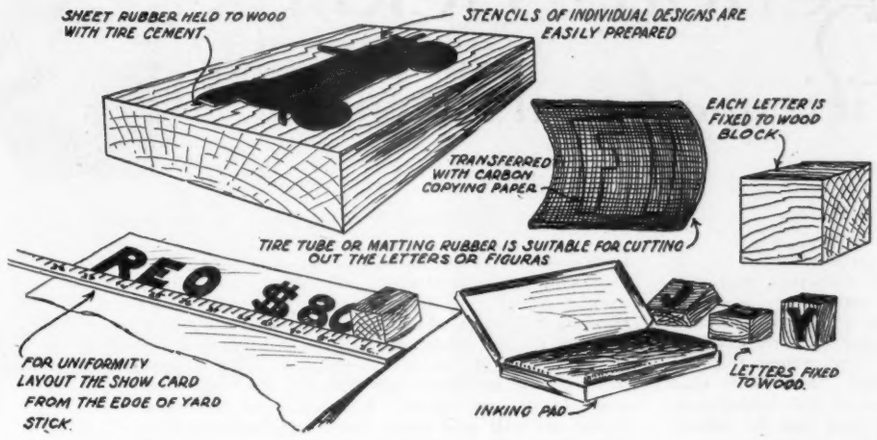
Putting a Tax on Swearing

Did you ever try to stop swearing around the office? A certain firm in Oklahoma did, and had very little trouble doing it. Their plan was this: Every time a man swore in the presence of one of the lady employees he was requested to put a nickel in a box. The money obtained in this way was used to buy candy for the office force, and in a short time all swearing ceased. Why not try this system in your place of business? —I. C. Scott, Enid, Oklahoma.

Advertise

You cannot carry on successfully without taking advantage of that great business builder—advertising. Doing business without it is like winking at a pretty girl in the dark, you know what you are doing but she doesn't.—J. H.

Stencil Letters Cut From Sheet Rubber


SHEET RUBBER HELD TO WOOD WITH TIRE CEMENT
STENCILS OF INDIVIDUAL DESIGNS ARE EASILY PREPARED
EACH LETTER IS FIXED TO WOOD BLOCK
TRANSFERRED WITH CARBON COPYING PAPER
TIRE TUBE OR MATTING RUBBER IS SUITABLE FOR CUTTING OUT THE LETTERS OR FIGURAS
REO $80
FOR UNIFORMITY LAYOUT THE SHOW CARD FROM THE EDGE OF YARD STICK
LETTERS FIXED TO WOOD.
INKING PAD

Extra size letters are frequently needed in making display cards or price cards for the show window of the garage or sales room, yet these are expensive and hard to procure. With a piece of sheet rubber as an inner tube or rubber matting, some wooden blocks, rubber cement and a pair of scissors letters and figures of serviceable use may be prepared in only a short space of time.

Letters and figures are transferred to the rubber using a piece of typewriter carbon paper and marking around the edges of the letters with a pencil. These are then cut out with the scissors and fixed in a reverse position to the wood blocks with the tire cement.

An ordinary inking pad as is used with the dater, is the means of inking these stencils. In making a poster or sign lay a yard-stick on the paper and place the stencils one at a time at the edge.

Stencils of individual design can easily be worked up from these materials.

Selling Tractors

Editor MOTOR AGE—My experience in selling tractors the last year in the south central part of Iowa has developed a method of selling tractors which has proved very successful.

First, selling the tractor.

Second, thorough instructions.

Third, selling service.

The first step in selling a tractor is to get the farmer sold on the size and type of tractor which will fulfill all his needs.

Explain in detail the convenience of the tractor, the handling, etc.

After he has been sold on the machine the big part of the future sales begins. The part a great many dealers neglect and which loses many sales.

"Selling of Service"

The farmer will have to be sold on "Service." This can be done by first:

Instruct the owner thoroughly, how to operate his machine, under all conditions. Instruct him thoroughly when and where to oil and grease his machine. Get him thoroughly familiar with the machine from top to bottom and front to rear before leaving him run it himself.

The first week of running will tell whether or not the tractor will do all you claim for it.

If the farmer is not instructed how to operate the machine, he may have trouble the first thing and perhaps ruin the machine. In a case of that kind where the farmer ruins his machine, puts the blame on the machine the first thing (which would be the natural thing for him to do), in place of putting the blame on the sales and service man that sold him the machine and neglected to give him full instructions for care and operation.

Then when this is done the owner will readily see that the dealer is interested in having the machines go out working properly and willing to render good service when it is needed, and the owner will be only too glad to pay full price for any services rendered, if he is thoroughly satisfied in his own mind that the dealer will give him good service.

If this is followed out carefully you will find that this will lead to more, better and bigger sales.

Let's look forward to the proper instructions and the sale of service and the big result will be more sales. Let's go.—A. W. Frantnick, Phoenix, Ariz.

Cut Out the "No-Profit"

A tire dealer in a middle western city keeps a record of all the work done on which no profit is made. Each morning he goes over the record of the day before. By studying the figures he is able to do one of two things. He either discontinues the profitless work or arranges to handle it on a basis that will net a profit.

Try the plan in your shop, or any other department of your business.

And It Paid

An instance of business acumen on the part of a garage proprietor is reported from the little town of Santa Maria, Cal.

Stewart & Rubel, of the Crescent Garage, at Santa Maria, kept hearing reports of the gasoline shortage and decided to make hay while the sun shone. There is a small gasoline refinery in the town. They went to the proprietor, ascertained his daily production and contracted for the entire output. Then they advertised in every hotel and newspaper

The Straight Line

The young folks may tell you that "The longest way round is the sweetest way home" but the fact remains that a straight line is the shortest distance between two points. You can draw a straight line between your business and your customers by advertising.—J. H.

Getting Truck Dealers

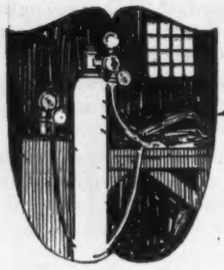
DON'T
WAIT

Get the Bethlehem Motor Truck Franchise while it is available for your territory. Link your name with "Bethlehem" and dominate your field.

TREMAIN MOTOR CO.
DISTRIBUTORS

810 FIRST AVE. SOUTH, FORT DODGE, IOWA

In order to put over the truck idea in Northern Iowa, the Tremain Motor Co., Fort Dodge, sent to the dealers in its territory a postal card illustrated above. The Tremain Motor Co. has always been strong on postal cards, form letter follow-up and has found that it pays in its business



Autogenous Welding

What it is and how it is applied

THIS is the eighth of a series of articles on autogenous welding and describes the different types of welds. These articles are intended to be of aid to the man who must learn the art of welding with little or no personal instruction. They also are intended as a referenec for the man attending a welding school. It is likely that during the first few months of his instruction many problems will come up that may be solved more readily with these articles on hand.

Finally, this series should be of benefit to any automotive service man or repairman, even though he never intends to have a welding torch in the shop. The reading of these articles will give him an understanding of the subject which should greatly aid him in general repair work. He will be better able to decide, when he has a part to repair, whether it is feasible or not to weld it, and if so, if it will pay. The more familiar one becomes with this art, the wider the scope of its application. The man who is versed in the art will find many clever applications that one who is less familiar with the subject would never dream of. An understanding of welding principles offers a new technique to the repair man.

Part VIII—Preparation of the Weld

THE proper preparation of the weld is a matter of great importance and the success of the work depends to a large extent on the care with which the preparation is made. It should be pointed out, however, that it is not always possible to follow the most desirable plan since the condition of the parts and their location may affect the matter to a considerable extent. In this case it is desirable to make as thorough preparation as the conditions will allow.

The selection of welding rods, fluxes and size of blowpipe head should be done with the greatest care.

In making an autogenous weld it is obviously necessary that fusion penetrate entirely through the metal. In working thin metal, ⅛ in. or less, it should be plain that there will be no difficulty on this score but in thicker metal the edges must be champfered or beveled to permit the lower surface to be welded. To appreciate the necessity of the bevel let us consider the difficulties in trying to weld together two ½-in. plates with abutting edges but no champfer.

Plates Should Not Be Parallel

With the blowpipe flame playing on the surface of the metal it would be necessary to melt the metal all the way down to the lower surface in order to obtain fusion on the lower surface and therefore secure a weld on the lower surface. A little consideration will show that such a performance would be difficult if not impossible. An alternative might be to attempt a fusion half way through an then turn the piece over. But even in this case it would be extremely difficult to produce a satisfactory job.

By champfering the edges the flame can readily reach the bottom surface and this is quickly fused together. At the same time metal is melted off of the welding rod to fill up the groove formed by the champfers of the edges.

As previously stated it is not necessary to bevel pieces less than ⅛-in. in thickness; from ⅛-in. to 3/16-in. a narrow champfer only is necessary; one in which the angle opening is 45 deg. is sufficient. From 3/16-in. up an angle opening of 60 to 90 deg. should be used, the angle being dependent somewhat on the nature of the material and the location of the weld. Experience will soon show the angle advisable in each case.

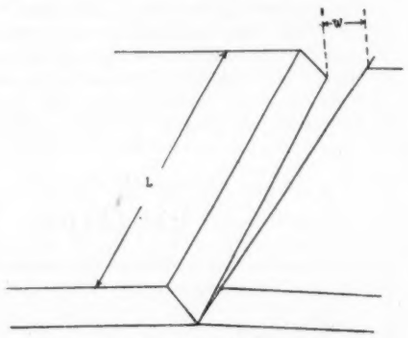


Fig. 21—The edges of two plates to be welded should not be placed parallel but at an angle as shown

The champfering may be done with a grinder, a cold chisel, an air hammer or in some cases by a cutting torch. In case a torch is used care must be taken that all the oxide produced on the surfaces cut by the blowpipe is removed before welding is begun.

It is not sufficient merely to separate the edges because in this case the upper corners will be melted down and will flow into the space between the pieces, adhering to the sides rather than fusing intimately. That this does not produce a weld experience will quickly prove.

In welding two pieces together the edges should not be placed exactly parallel, Fig. 21, unless the parallel location is unavoidable. The reason is that two plates tend to creep together as welding progresses and to counteract this tendency the plates should diverge so that when the job is finished a smooth weld with parallel edges will be the result, Figs. 22 and 23. A moment's consideration will explain this tendency.

In making a weld the edges are joined little by little beginning at one end and working to the other end of the seam. As soon as the weld at a given point on the joint is completed the blowpipe passes on to the next point, and the point just finished immediately begins to cool and contract.

Plates Come Together

If the edges are divergent to begin with, the first small section of the weld becomes a hinge or pivot as soon as it is completed, and the next little section as soon as it is finished starts to contract, pulls on the two plates and swings them a little closer together. The contraction of the next small section closes the gap still further and this action continues until when the job is finished the edges are quite parallel and the weld may be considered perfect.

This diverging of edges is only necessary where one or both of the pieces are free to move. If both are well anchored to heavier parts this precaution is neither necessary or perhaps possible. A crack in a water jacket for example might be considered as two abutting plates but these plates are part of the same piece—they are both part of the cylinder casting. And, therefore, distortion of the sort just described cannot occur.

Another method to prevent creeping is to tack the edges of the abutting plates

How Plates Draw Together When Being Welded

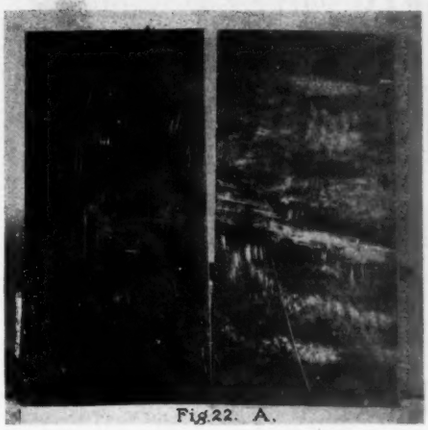


Fig. 22. A.

Fig. 22. B.

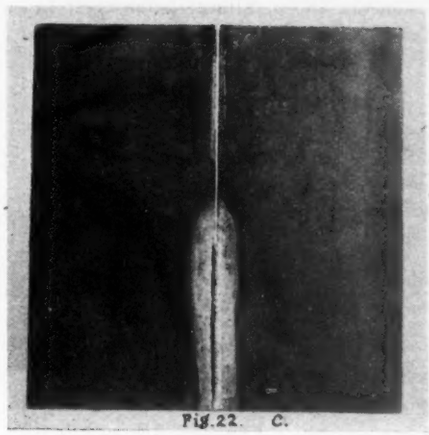


Fig. 22. C.

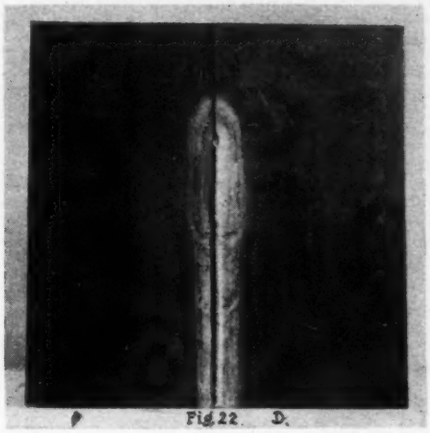


Fig. 22. D.

This series of four photographs shows in a very interesting way the importance of divergence in welding two plates which are free to move. The first photograph, A, shows the two plates with their edges in contact at one end and perhaps three-eighths of an inch apart at the other end. The second photograph, B, shows the beginning of the weld. It will be seen that the plates have started to creep together. The third photograph, C, shows the job nearly half completed and it will be noted that the edges are coming together very nicely. The fourth photograph, D, shows the weld about three-fourths finished. The edges are practically closed now, and this is as it should be, for the remainder of the work can be done without any difficulty. The fact that the edges are parallel before the job is finished indicates that a certain amount of leeway in the necessary divergence is permissible

together at intervals. By tacking is meant spot welding with the blowpipe. This method has the disadvantage that warping or buckling will ensue under certain conditions. In many cases these troubles may be eliminated by subsequent rolling or hammering of the piece but the first method is far more satisfactory.

May Overlap at Ends

If no provision is made against the creeping together of the edges, the gap between the pieces may not only close up tight but even overlap at the ends, Fig. 23, C.

The amount of divergence depends upon the thickness and nature of the metal and upon the speed with which the welding is done. If the welding is done slowly the effect of contraction must be greater than if it is done rapidly. Therefore, a slow welder will allow greater divergence than a fast one. Likewise since it takes longer to weld two thick plates of metal than two thin ones, greater divergence must be employed.

Also a metal with high conductivity will carry the heat away from the weld much faster than metal of low conductivity, therefore, the former calls for greater divergence. In the same way the metal with a high rate of expansion under heat demands the greater divergence.

The welder will soon know from experience just how much divergence is necessary in each particular case. As a guide it may be stated that divergence should vary from 2½ to 6 per cent, and an average figure used by some operators is ¼-in. per foot.

Where it is found that too great divergence has been allowed, the fault may be corrected by slowing down the rate at which the weld is being done; similarly, if not sufficient divergence has been provided the welding should be sp eded up.

(To be continued.)

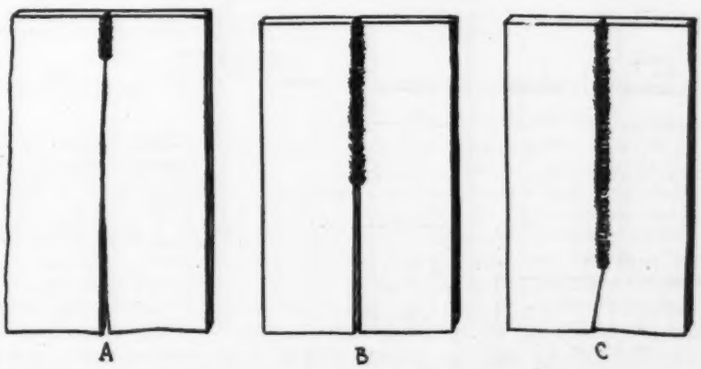


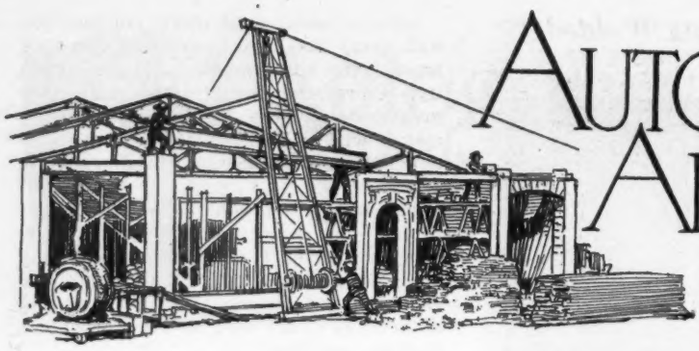
Fig. 23—This sketch shows how plates which are started parallel will draw together and overlap as shown at C

HANDLEY-KNIGHT CARS DUE OCT. 1

Detroit, Sept. 3.—Knight Motors, Inc., of Detroit has been awarded selling rights for the new Handley-Knight four-cylinder car being produced at Kalamazoo. Thomas H. Walker, vice-president and general manager of Knights Motors, said his company will handle the new car in connection with the R & V Knight six and four, the latter of which is due this month. Delivery of Handley-Knight cars is promised Oct. 1. The company controls distribution for thirty-six counties.

BEAVER DAM GETS BATTERY PLANT

Milwaukee, Wis., Sept. 6—The Duplex Storage Battery Co., Milwaukee, has finally selected Beaver Dam, Wis., as the permanent seat of operations after negotiating several months with numerous other Wisconsin cities. The factory was established in Milwaukee on Jan. 1. By the end of the year its present building must be vacated under condemnation proceedings for bridge construction. At Beaver Dam the former plant of the Beaver Dam Mfg. Co. has been purchased and is now being remodeled and retooled. The capitalization of the Duplex company is being increased from $60,000 to $500,000. The company makes a line of storage batteries for motor cars, street cars, telephone and telegraph, farm lighting plants, etc.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER

Ramp Construction in Small Garage

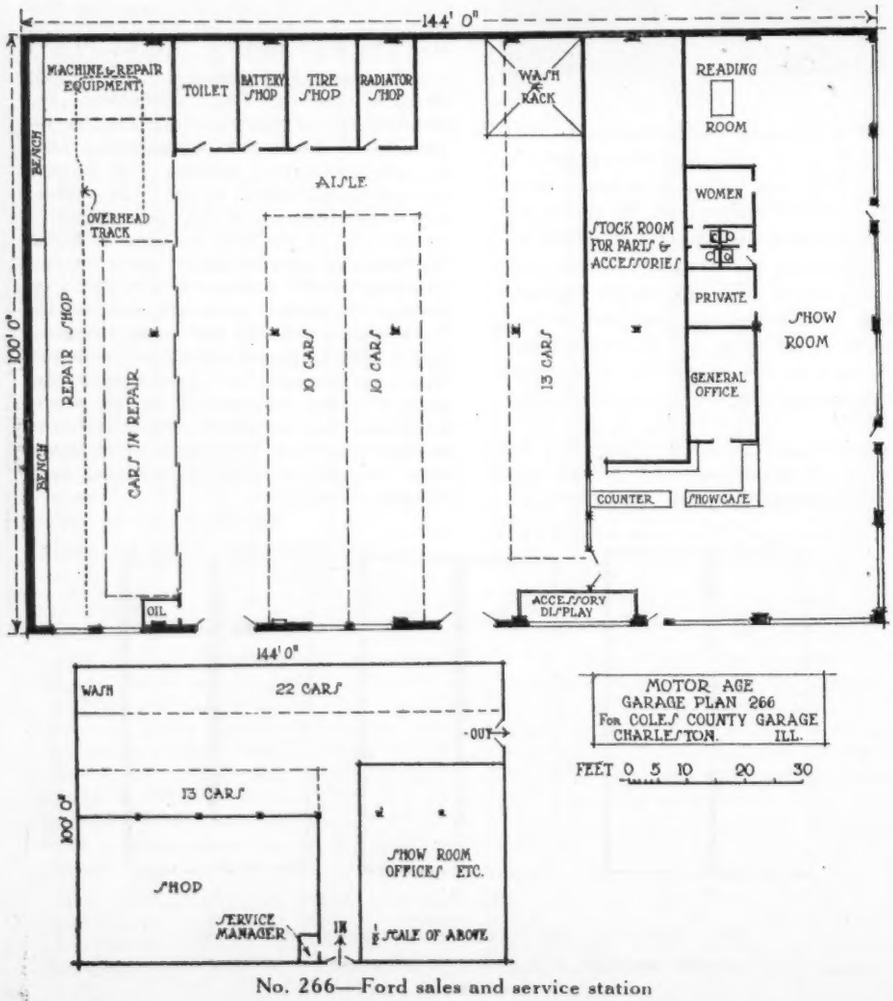
No. 265

We have recently purchased a lot 50 ft. wide and 125 ft. deep with the intention of erecting a general purpose garage. This lot faces on a main street 50 ft. front and extends to an alley in the rear. It is on a slope 19 ft. higher in front than at the rear. We desire to construct two stories below the main street frontage and one floor on a level with the main street entrance.

We handle the Nash cars and trucks and the Scripps-Booth cars and sell about 100 a year, this being our second year in business. We expect to give service on our own cars and trucks and use the middle floor for public storage.

Will have a battery charging outfit and tire department but do no vulcanizing. We prefer to use ramps instead of elevators as we will have only an 8 or 9 ft. rise. How long should a ramp be to rise 10 ft.? Our lot is about the middle of the block and we expect that other garages or business houses will be erected adjacently in a short time, so there would be but little chance of side light. Will work four mechanics and also a small accessory department. We have no definite plans or ideas in regard to building and a sketch of the layout would be highly appreciated.—District Nash Motor Co., Inc., Roanoke, Va.

Designing a 50 ft. garage with ramps instead of an elevator is ordinarily hopeless, but we have spent considerable time on this just to see what could be done in the way of a practical solution.



No. 266—Ford sales and service station

IN this department MOTOR AGE aims to assist its readers in their problem of planning, building and equipping service stations, garages, dealers' establishments, shops, filling stations and in fact any buildings necessary to automotive activity.

When making requests for assistance please see that we have all the data necessary to an intelligent handling of the job . Among other things we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

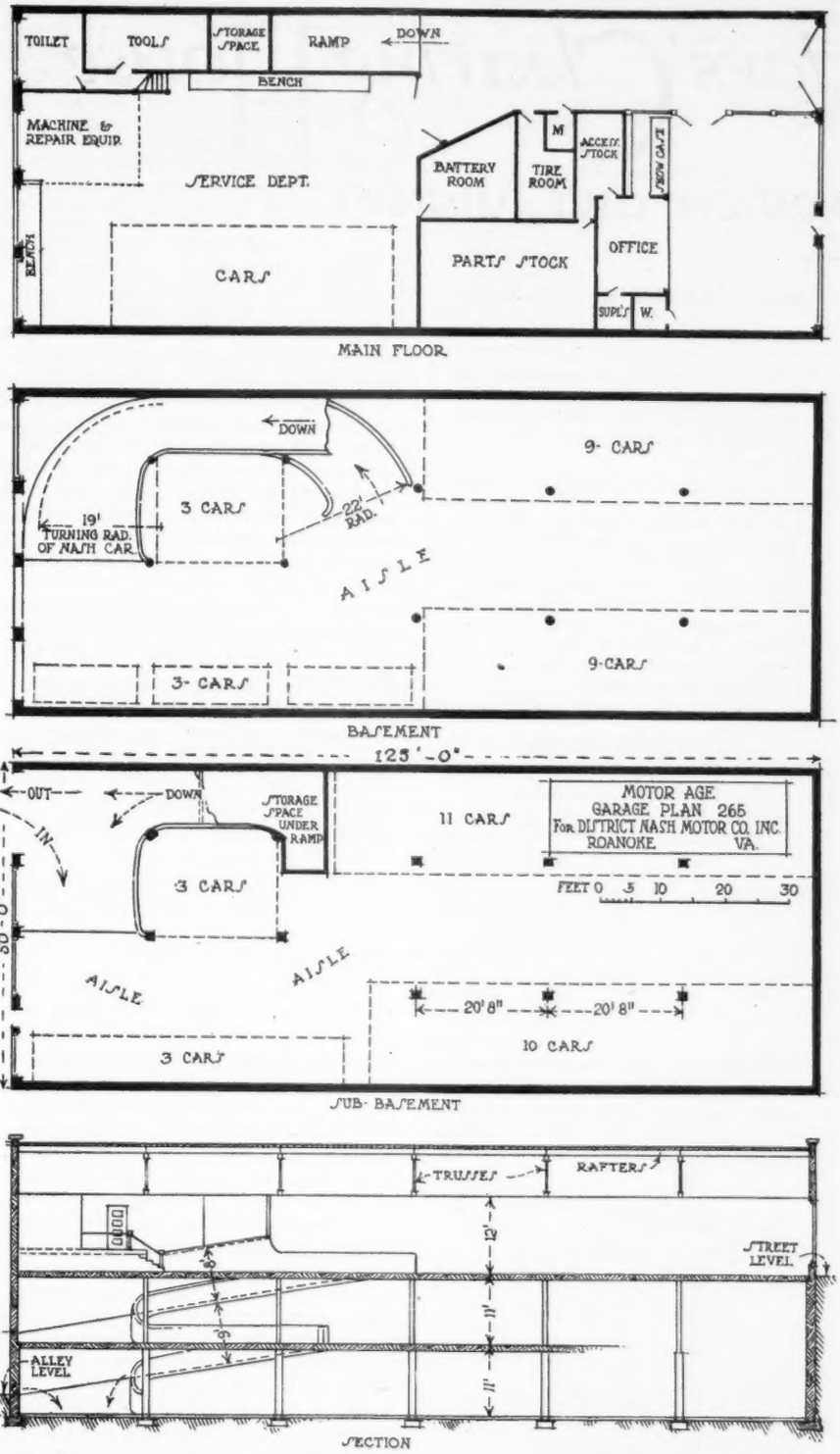
Number of men employed in repair shop.

And how much of an accessory department is anticipated.

In the first place, we learned through the Nash company's Chicago agent that a Nash car can turn in a 38 ft. circle, or has a 19 ft. turning radius. They were unable to give us figures of the turning abilities of the truck but it is safe to assume that if the car can turn in a 38 ft. circle, the truck would require considerably more, probably 45 ft., which is practically the entire width of the garage. With a successful ramp arrangement a car should be able to negotiate it in one forward operation without any stopping or backing.

It is out of the question to make a straight ramp as it would require 50 or 60 ft. at least, with a rise of 10 ft., and this without turning approach at one or both ends would use up most of the building. After the width of the ramp is deducted storage space for but one row of cars with suitable aisle would be left.

After considering all these problems, we decided that it would be necessary



No. 265—Ramp construction in small garage

in view of space economy, to combine the turning space and the ramp, making it in the form of a helicoil. In order to make the space within the circle large enough to be of use for car storage, we have elongated the form slightly instead of making it circular.

As it stands, however, this ramp system would be as expensive, if not more so than the installation of an elevator and the building would not be good for any other business in case of its sale.

The storage capacity of the two lower floors is reduced from a maximum of seventy-two cars without elevator or ramp to fifty-one cars. With the best elevator arrangement sixty cars could be stored on the two floors, making a gain of nine cars. The revenue from nine cars at $10 per month should be at least 50 per cent profit, and by using a push button control, thus making an attendant unnecessary, the percentage of profit would be increased.

A 50 ft. building does not lend itself very well to the use of ramps and in general they are better suited to larger buildings, and those which would have a certain amount of waste space under other conditions. For instance, a 60 ft. building naturally has about 10 ft. of width to spare. This 10 ft. strip is well adapted for use and does not at all interfere with the layout of the building.

In regard to the height of the ceilings our sectional view gives them as 11 ft. from floor to floor. We would advise keeping as much space as this for even though you have no heating plant there are always a few pipes bound to be in the way and there would be danger of some Nash truck wrecking them.

No. 266

FORD SALES AND SERVICE BUILDING

We are sending you an outline for our new garage. Please send us the best plans for laying out a Ford garage.—Coles County Garage, Charleston, Ill.

This plan gives a rather liberal amount of space to showroom purposes, but there is no harm in this as there are always a number of good looking rebuilt jobs which may be shown off in the back part. Here they will notice quickly and help speed up the turnover of stocks.

The lighting of this entire building would be by skylights, sidelights being unavailable where they would be of any benefit to the shop. The roof would be supported by two rows of abutting trusses, the abutting ends supported on a central row of posts.

Unless you are determined on having a side entrance, we believe a better arrangement could be followed along the lines indicated on the small half size diagram. This puts all the garage activities in the rear, while the sales and service are given the best positions.

ELM TIRE LEASES FACTORY

Racine, Wis., Sept. 6—The Elm Tire & Rubber Co. of Racine, Wis., incorporated recently with a capitalization of $200,000, has leased a large vacant factory building for a long term and is buying equipment for the manufacture of pneumatic and solid tires, mechanical rubber goods, etc. It is expected that production will be under way by Sept. 1 or 15. The promoters of the enterprise include Laurence McKimm, Otto E. Ahrens, of Racine.

NEW FORD SERVICE STATION

Port Huron, Mich., Sept. 6—A. P. Parfet Co., Ford distributor in Port Huron, has begun construction of one of the handsomest and most complete sales and service buildings in the state. The structure which will be two stories high with a basement will cost $125,000 and will be equipped with machinery equal to the larger service stations in Detroit and other large cities. There are 3,800 Ford owners in Port Huron and the farming country adjacent and service demands compelled the construction of a new station.

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor Motor Age

JOHNSON CARBURETER ADJUSTMENT

Q—Instruct how to adjust the Johnson carbureter on a 1918 Oldsmobile 45.—H. E. Borns, Newark, N. J.

It is our belief that the car is a 1917 model as you state it is equipped with a Johnson carbureter. To adjust the carbureter proceed as follows: Before stating the engine turn both the low-speed screw and spray needle to their seats and set the throttle lever stop screw to approximately the correct position for closed throttle. Next open the spray needle on the bottom of the carbureter Fig. 1 one and a half turns, With the adjustments in this position the engine can be started.

After the engine has warmed up to the normal driving temperature, place the spark lever in a fully retarded position, open the throttle quickly and, if the engine does not backfire, the mixture is slightly rich and the spray needle should be closed by turning to the right about an eighth of a turn. Open the throttle quickly again and repeat this operation until the engine does backfire, which will determine a lean mixture. Open the needle slightly to correct the mixture, which will give the correct adjustment for all high and intermediate speeds.

Adjust the throttle stop screw until the desired idling speed is secured, or about 240 r.p.m.

If the engine does not fire smoothly, the low-speed mixture is too rich and is to be corrected by backing out the low-speed screw on the side of the mixer chamber, which will admit sufficient air to make the firing even and smooth, then lock in position with the lock nut.

If the engine has increased in speed from this adjustment, restore the idling speed by unscrewing slightly the throttle stop screw and if necessary, reset the low-speed screw, both of which must be adjusted in combination.

After these operations have provided the correct adjustments for the entire range, they are permanent, and there are no conditions which will change the carbureter and operation. If a more economical mixture is desired, the high and intermediate adjustments may be repeated, having the spark set in the usual driving position instead of retarded. This adjustment will slightly reduce acceleration, which will not be as responsive as a richer mixture. Be particular to leave the choker on the side of the carbureter in a wide open position and do not attempt to adjust it with the choker partly open.

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by some one else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

Miscellaneous

USE OF MOTH BALLS

Q—Tell me the truth about the idea of putting some moth balls in the gasoline tank. I have heard about this for some time and tried it on an old Dodge and it seems to make it pull better and start easier but is there any harm in keeping this up?—T. C. Carney, Tulsa, Okla.

The truth of the matter is that you are assuming certain things that are absolutely false. The United States Bureau of Standards report after conducting a series of very conclusive tests that there is no measurable difference between the power produced by gasoline with, and the same gasoline without the material added. Moth balls are largely naphthalene and do not contain any camphor as most people believe. Although there is no harm that will result from the use of moth balls yet there is no advantage gained. There are many compounds of this kind on the market to-day for which decidedly exaggerated claims with regard to increased power, increased mileage and carbon removal are made. Tests show that whenever better performance is obtained by using the product it is a case of better carbureter adjustment in compliance with the instruction given with the product rather than the use of the product.

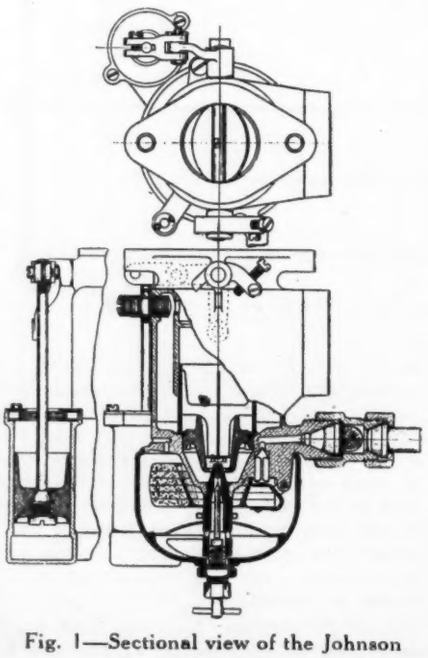


Fig. 1—Sectional view of the Johnson carbureter

KEROSENE AS A FUEL

Q—What is the effect of using kerosene in motor car engine? Would there be excessive carbon? Would the engine overheat and would there be more strain than when gasoline was used? Would high compression and high speed be the best? How would the air adjustment of the carbureter have to be set?

2—Would it be of any advantage to take a number of turns around the exhaust pipe with the feed pipe to the carbureter so as to warm the fuel when it comes into the carbureter?—Everett Hunter, Cornallis, Ore.

1—The use of kerosene in the automobile engine as constructed today is not very satisfactory. There is some difficulty using the present gasoline, and kerosene being of a lower grade will cause considerably more trouble.

In the first place the carbureters are not designed to handle kerosene. Kerosene requires a great deal of heat to vaporize it and, furthermore, it requires considerable heat applied to the mixture to prevent condensation in the manifold. Even under the best of conditions it is necessary to change to lubricating oil very often because of the great amount of fuel that gets by the pistons and leaks into the crankcase causing excessive dilution of the oil.

Many engines develop the fuel knock using the present gasoline and the knock produced by kerosene is even worse. Kerosene has been used after the engine has been started on gasoline but the operation is not very satisfactory. However, there is no logic in trying to use kerosene. At present there is very little kerosene produced when the gasoline is refined by means of the cracking process. It is estimated that only about 12 per cent of the original crude is turned into kerosene as compared to about 42 per cent that is being turned into gasoline. The logic is that instead of trying to design to accommodate kerosene the thing to do is to produce a greater percentage of gasoline by the use of more efficient cracking methods and design-

ing the engines to use the grade of fuel that is being produced in the greatest quantity.

2—It is not only necessary to heat the fuel but also the mixture to try to prevent condensation in the manifold.

CLUTCH THRUST BEARING REPAIR

Q—What causes the clutch collar on a Chevrolet 490 to wobble. It has a grinding noise. How can this be overcome?—Clarence Hofkes, Boyd, Wis.

The wobbling of the clutch spider accompanied by a grinding noise when the clutch is released is an indication that some of the balls in the clutch thrust bearing are worn or broken. In this case it will require a complete removal of the clutch, together with the flywheel and anchor stud. Detailed instruction for the removal of the clutch and flywheel assembly was given in the Aug. 12 issue. The instructions for reassembling were also given. In making the thrust bearing repair, first examine the balls and race of this bearing, and if pitted or showing the slightest indication of wear, the entire assembly should be replaced.

Place the flywheel in the position shown in Fig. 2 on a bench or stand. Then force the ball race into the flywheel casting. The race should go in evenly and come to a seat evenly, otherwise the bearing will quickly destroy itself. Assemble the balls and clutch spring anchor stud, packing the balls in grease. Slip the clamp shown in Fig. 2 over the end of the stud. This holds it firmly in place and permits one man to put on the retaining springs. Slip on three old valve springs over the end of the stud and pin in place. The clamp may now be removed and the stud, with the thrust bearing, cannot fall apart in reassembling the clutch.

WATER IN CRANKCASE

Editor MOTOR AGE—Mr. Wm. Lewis, Lehigh, Mont., asks for cause and remedy for water in crankcase of a Paige 6 with Rutenber engine in the Aug. 19 issue of MOTOR AGE.

I suggest that Mr. Lewis examine his water pump and ascertain whether a small hole has been drilled in pump support bracket which is fastened to timing gear housing. This hole may be closed by dirt. If Mr. Lewis will check up on this he will find that the water leaking through the packing gland nut drains into the case by following the pump shaft as the bottom of shaft is lower than the top level of pocket created.

If there be no hole, then drill a 3/16 in. hole in bottom of pocket.—F. A. Merrill, Campbell Auto Co., Idabel, Okla.

Editor's Note: The suggestion made by one of our readers is very good indeed and we are supplementing it with an illustration. Often times troubles of this kind come up and are individual cases that have to be treated by actual experiment. By reference to Fig. 4 you will see a pocket A which is referred to. It is very easy to see that if this hole in the bottom of the plug is clogged up, water will soon collect until it reaches the level of the pump shaft and then will follow the shaft and work into the timing gear housing, thence to the crankcase.

TO assist readers in obtaining as a unit all information on a certain subject, MOTOR AGE segregates inquiries in this department into divisions of allied nature. Questions pertaining to engines are answered under that head and so on.

Miscellaneous

H. E. Borns.....Newark, N. J.
T. C. Carney.....Tulsa, Okla.
Everett Hunter.....Cornallis, Ore.
Clarence Hofkes.....Boyd, Wis.
Herman Kokemueller.....Milwaukee, Wis.
T. H. Norman Garage....Yazoo City, Miss.

The Electric System

H. E. Borns.....Newark, N. J.
J. D. Porter, Repairman, Pittsburgh Prov. and Pack. Co.....Pittsburgh, Pa.
Phil Murphy.....Butte, Mont.
James Tallman.....Sidney, Ohio
J. P. Huxtable.....Miles City, Mont.
Walter E. Rothgeb.....Middletown, Ohio

Rebuilding

J. L. Nugent.....Colorado Springs, Colo.

The Power Plant

Ralph Dick, Overland Service..... Wichita, Kans.
L. S. Barge, Yorkshire Garage..... Yorkshire, Ohio
A. D. Stuehm, Square Deal Garage..... Peotone, Ill.
Wm. Haith..... Peru, Neb.
Barney Switzer.....Michigan City, Ind.
John T. Rosa.....Detroit
G. E. Flemming.....Bogard, Mo.
J. Hartler, Day and Night Garage..... Harrisonville, Mo.
R. L. Mangnall.....Tonica, Ill.
G. M. Newpart.....Carlisle, Ark.
W. K.....Milwaukee, Wis.
H. E. Borns.....Newark, N. J.

REAR AXLE ADJUSTMENT

Q—We have a Nash 2-ton truck which is giving us trouble. There is a noise in the rear axle when coasting but under load this is not noticeable. New rear wheel hubs and rear wheel bearings were installed. We have located the trouble in the axle drive shaft. The axle shaft runs out against the rear hub. What is the trouble?

2—We have a Curtiss four-cylinder air-cooled sled engine. What would be the best carbureter and ignition system to use on this engine, as we are going to use it in a boat. It has an air propeller.—T. H. Norman Garage, Yazoo City, Miss.

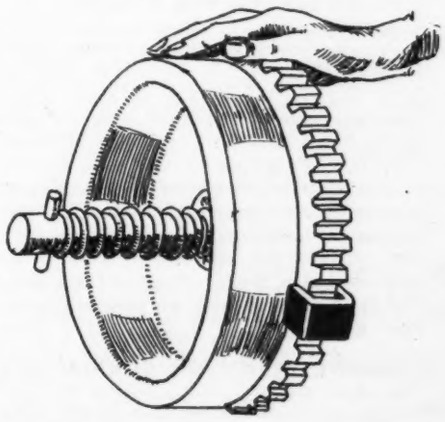


Fig. 2—Position in which flywheel should be placed, showing clamp in place

1—The noise which is only noticeable when the truck is coasting is probably caused by too much back-lash in the gears. To adjust the drive gear, loosen the eight screws which hold the cover plates on the front side of the differential housing. You will note the lock which is attached to the cover plate, which locks the adjusting nuts, preventing them from turning. If closer adjustment of the bevel gear and pinion is desired, as in your case, loosen the adjusting nut on the right side and tighten the adjusting nut on the left side. If bevel gear and pinion are meshed too close, loosen the adjusting nut on the right side.

It is absolutely necessary to tighten one adjusting nut the same number of turns that the other nut has been backed off. After the correct adjustment has been made, make certain that the adjusting nuts are tight and that the notches are in such a position that the lock on the cover plate can be inserted. When either the drive pinion or the ring gear is adjusted it is always necessary to make some adjustments of both. The adjusting nut for the pinion is located in the front end of the pinion flange.

To make the adjustment, first remove the lock. Turn the adjusting nut to the right to move the pinion backward. Turn to the left to move the pinion forward. After making the adjustment, replace the lock. In order to aid you in locating the parts mentioned, refer to Fig —.

2—We are in no position to make any recommendations on any manufacturer's carbureter or ignition systems. In making a choice you will, therefore, have to judge the merits of the product by the claims of the manufacturer.

The Electric System

STARTER FAILS

Q—Why are no fuses used on a 1919 Oldsmobile 45?

2—Would the engine turn over if the resistance wasn't burned out on a Delco system?—H. E. Borns, Newark, N. J.

1 —Fuses are not necessary on this system as a circuit breaker is provided.

2—If the engine will not turn over it may be attributed to one or more of the following facts: If the starting motor does not rotate at all, the battery may be discharged. Starting switch not making good contact. Poor brush contact due perhaps to a dirty commutator. Loose battery terminals. If the battery is in good condition, proceed to go over the connections beginning with the battery. Be sure to examine the ground connection from battery to frame. If the starting motor turns over very slow it may be due to improper action of the brushes because of an accumulation of sticky dirt and grease.

During the cranking operation when the starting pedal brings the motor clutch gears into mesh, a pin is withdrawn allowing the motor brush switch to make contact on the motor commutator. At the same time the generator switch breaks contact which cuts out the

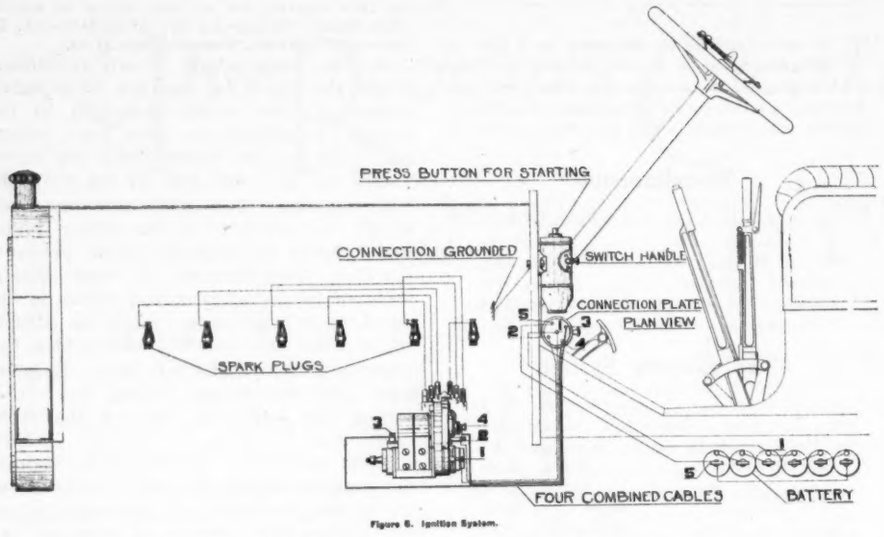


Fig. 3. Westinghouse system on a Matheson 6

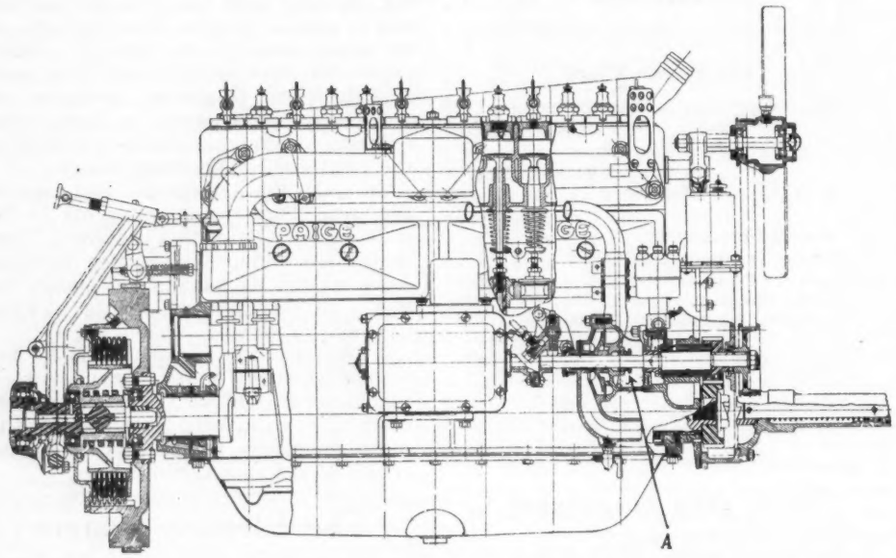


Fig. 4. Diagram of Rutenber engine showing pocket indicated at A in which water may collect and work its way into the crankcase

generator element during the cranking operation. Failure to get this action will give the result described.

When the ignition switch is turned on current is also sent through the generator windings. When the starter pedal is pressed down the generator brushes should lift at the same time the motor brushes are making contact. If you will remove the front cover plate you can readily see the trouble.

SAFETY SPARK GAP

Q—A new winding, condenser, slip ring, platinum points were put in an Eiseman G. R. 4 magneto and the magnets were charged. Now if you take a screw driver and hold it ¼ in. or more away from the slip ring it has a snappy spark but by turning it will jump the safety gap only once in a while when it is spun real fast. What causes this.—J. D. Porter, Repairman, Pittsburgh Prov. and Pack. Co., Pittsburgh, Pa.

Since the information you have given us is so limited we cannot give a positive answer. If you are driving the magneto without having it connected to a spark plug the spark will jump across the safety gap at regular intervals. The safety spark gap is a means of protection for the armature and other parts which permits passage of current to the ground.

MAGNETO FOR LIGHTS

Q—Would it be possible to connect the H. T. magneto on a Buick roadster direct to a storage battery and then back to distributer for ignition so the tail light, dash lamp and spotlight could be taken from the battery as there is not enough room for a generator?—James Tallman, Sidney, Ohio.

This is impossible because the magneto generates an alternating current which cannot be used to charge a storage battery without the use of a rectifier. We believe that if proper study of the engine layout is made it may be possible to install a generator.

CURRENT INDICATOR BURNED OUT

Q—The battery indicator on a 1917 Dodge which has been run 6,000 miles does not show charge or discharge. The battery is above 1,250 at all tests. The generator showed 5 amperes charge when tested and the wiring seems to be O. K.—Phil Murphy, Butte, Mont.

If the generator shows charge with another indicator it is very probable that the indicator is burned. To ascertain whether you are correct, connect an ammeter in place of the indicator and see if it indicates. If so, it means that the instrument is burned and it will be necessary to install a new indicator. If you so desire, you can install a Roller Smith ammeter universal model in place of the present indicator.

RESISTANCE UNIT BURNED OUT

Q—The model 284-C Remy generator used on the 1919 Auburn 6-39 has been overheating badly since one of the battery connections worked loose. The ignition seems O. K. and the ammeter shows about 15 amperes charge at 200 m.p.h. but generator gets so hot in 20 min. to ½ hour that one cannot touch it. Is the thermostatic regulator used on this model and are there any fuses which may be burnt out. All connections are O. K. and lights are all right.—J. P. Huxtable, Miles City, Mont.

This car is equipped with the Remy thermostat control which is connected in series with the shunt field of the generator. When the contacts are closed full current passes through them and permits full current output from the generator. When the generator is in operation and the heat rising from the commutator is sufficient to warp the thermostat blade, the contacts are separate and the thermostat resistance inserted in the field circuit. This additional resistance in the field circuit reduces the field current and the output of the generator.

The thermostat is composed of a resistance unit, two silver contact points and a spring blade holding one of the contact points. The blade is made of a strip of spring brass welded to a strip of nickel steel—a combination which warps at its free end when heated, due to the greater expansion of the brass side. The blade is riveted through insulation washers to the bracket permanently and the spring tension is so fixed that it holds the two contacts firmly together at low temperature; but as soon as the temperature rises to approximately 175 deg. Fahr., the blade bends and separates the contacts.

The thermostat resistance serves the double purpose of reducing the charging rate and acting as a protective fuse to the generator in case the battery or generator charging circuit should ever become disconnected in operation, either from accident or neglect, as the resistance wire would then burn out and prevent the generator windings from being damaged. Loose or corroded battery terminals are very often the cause of high resistance in the charging circuit. This condition produces high voltage at the generator and therefore, high voltage is impressed across the thermostat resistance at the time the points are open. The excessive current forced through the resistance unit will cause it to burn in two and open the field circuit.

This reduces the generator output to zero and thereby prevents damage to the generator windings. A burned thermostat will be indicated by the ammeter dropping to zero, then returning to maximum when the generator has cooled. Further,

a burned thermostat resistance is an indication of high resistance in the charging circuit and this condition should be corrected before installing a new resistance unit, as such an installation will offer no relief unless the original cause of the burning is eliminated. Resistance unit trouble should be corrected immediately as the thermostat points are apt to burn and possibly stick, due to the heavy arcing at the time they open. It is evident from the description you have given of the trouble that the loose battery connection caused the resistance unit to burn out and therefore the only thing to do is to correct the cause, which you state you have already done, and install a new resistance unit.

WESTINGHOUSE SYSTEM

Q—Publish wiring diagram for the Matheson Six.—Walter E. Rothgeb, West Middletown, Ohio.

This is shown in Fig. 3.

Rebuilding

REBUILDING A DODGE

Q—If Hudson super-six valves are installed in a 1920 Dodge engine, what model Hudson valves would it be best to use, or are all super-six valves the same?

2—How could the work of reaming out the Dodge valve seats be best accomplished? Could it be done by using regular 45 deg. reamers in several sizes or would it be better to use a straight reamer to start with and finish with a 45 deg.?

3—What is the size of the super-six valves and the 1920 Dodge valves?

4—Is the size of the stem the same or would it be necessary to ream out the Dodge valve guides?

5—Do they use the same method of holding the valve springs in place? If not, what does Hudson use?

6—Could Dodge valve springs be used with Hudson valves or would it be better to use Hudson springs?

7—What other work would be necessary on the Dodge engine besides reaming?

8—Would it be necessary to do any work on the Hudson valves? If so, what?

9—Is there any danger of reaming out enough metal to break through into the water jacket of the Dodge in fitting these valves?

10—Would it add to the power to install a larger carbureter when using the larger valves?

11—Is there a company making a radiator shell fitted with a hand controlled shutter similar to that used on Hudson and Essex to fit on the regular Dodge radiator?

12—Is there any way to increase the oil pressure on the 1920 Dodge? The gage does not show any pressure when the engine is idling but goes to half a pound at 15 m.p.h. and to 1½ lbs. at 30 m.p.h. This is after driving 100 miles with fresh oil in crankcase. The oil gage has been changed and seems to work all right.—J. L. Nugent, Colorado Springs, Colo.

1—All Hudson super-six cars have the same valve sizes.

2—Reaming of the valves can best be accomplished by using the 45 deg. reamers during the entire job. After reaming the valve seats it may be necessary to take a small cut off of the valve head. The next operation following this would be grinding.

3—The Dodge valve diameter is 1.6875 in. The stem is .370 in. in diameter and 6.531 in. long. The Hudson valve diameter is 1.8125 in. The stem is .370 in. in diameter and 6.75 in. long.

4—As the stems have the same diameter it will not be necessary to ream out the guides.

5—The method is not identical. The construction is so near the same that the valves and springs are interchangeable.

6—If Hudson valves are used it is best to use the Hudson valves springs.

7 and 8—If the reaming is properly done it should be a very easy matter to get the valves to seat by grinding the valves in. There will be some slight difference in the length of the valve stems when the valves are reseated and therefore it will be ncessary to adjust the tappets. This can be accomplished by means of the adjusting nuts. After the engine is warmed up the tappets can be adjusted to about .001 in. which is about the thickness of ordinary wrapping paper.

9—There is very little danger if a careful job is done. We have records of several Dodge cars that have been rebuilt for racing purposes where Hudson valves have been installed and very satisfactory results were obtained.

10—It would be advisable to increase the carbureter size a little as it will give more power but poorer fuel economy.

11—A shutter may be purchased from the Auto Metal Parts Co., Des Moines, Iowa.

12—There is no adjustment provided for increasing the oil pressure on the 1920 Dodge cars. The oil gage can be adjusted to read as desired but this will not change the oil pressure that the pump is delivering. The gage is graduated to register 4 pounds as a maximum. At a speed of about 15 miles per hour the gage will read from ½ to 1 on the scale, and at a speed of say 30 miles per hour the reading should be about 3. The fact that your gage does not read exactly this amount should worry you as it is dependent upon the condition of the oil.

When the pressure drops down it is a pretty good indication that the oil is diluted. This dilution takes place immediately after changing the oil and will become noticeable by the gage reading after a very short period of operation. This dilution is caused by condensation of the mixture which drains past the piston rings down into the crankcase. Two articles that appeared in the August 19 and 26 issues give an account of what is happening to the lubricating oil in the automotive engine.

The Power Plant

NORTHWAY POWER CURVE

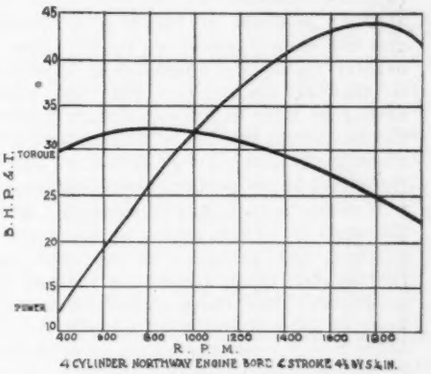
Q—Publish power curve of the 1915 Jackson Olympic 40 engine.—Ralph Dick, Overland Service, Wichita, Kans.

Power curve of the Northway engine having a bore and stroke of 4½ by 5¼ is shown in Fig. 6.

ENGINE HAS SHARP KNOCK

Q—A 1915 Ford has a sharp knock in the engine. It knocks once each round and seems to be in or about the timing gears. There have been new camshaft, crankshaft, connecting arms, pistons camshaft bearings, crankshaft bearing caps and new valves installed but it has not helped it any. It has plenty of power but runs unevenly.—L. S. Barge, Yorkshire Garage, Yorkshire, Ohio.

There are two quite logical possibilities for this trouble. It may be piston slap or worn timing gears. In the case of piston slap it is probable that you hear just one knock when the piston shifts from one side to the other at upper dead center just as the explosion is taking place. A knock of this kind is very hard to locate. About the only method for locating it is with a sounding rod and removing the pistons and examining them. This knock can occur even though the piston rings fit tight. Often times slightly bent connecting rods will also give a piston slap. If the timing gears are very badly worn there will be a very loud hum and perhaps a distinct knock. The only way this can be



4 CYLINDER NORTHWAY ENGINE BORE 4½ STROKE 5¼ IN.

Fig. 6

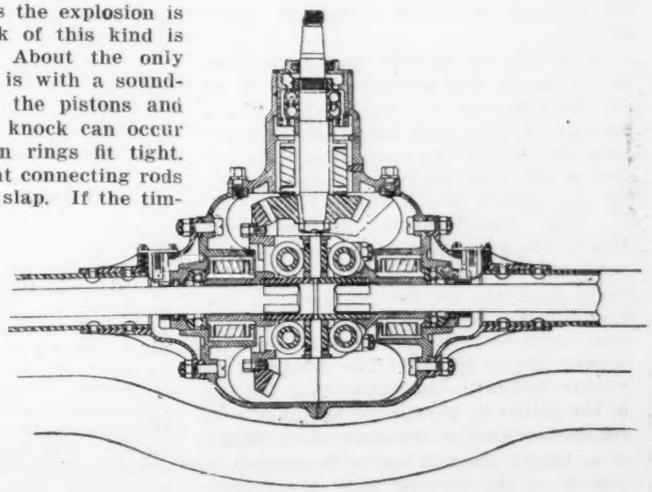


Fig. 5—Sectional view of the Clark axle on a 2-ton Nash truck

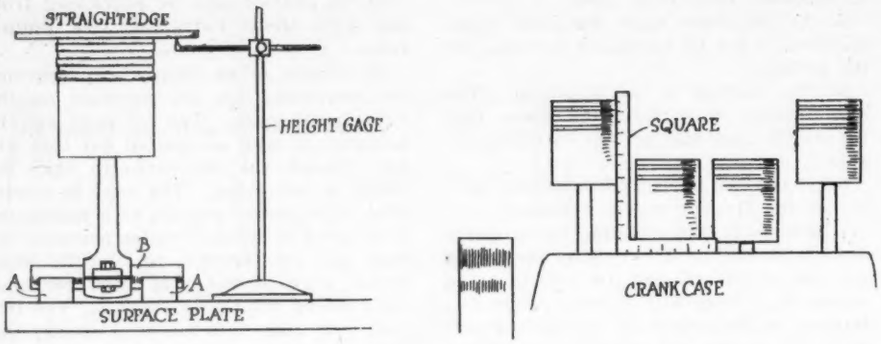


Fig. 7—To the left—One means for testing alignment of connecting rod bearings. To the right—By placing a square on the crankcase it is possible to check the rod alignment without removing piston and rod from engine

overcome is to install new gears. If it is piston slap it will be necessary to regrind or rebore the cylinder block and install oversize pistons and rings.

BALANCING CRANKSHAFT

Q—Show the proper method of balancing crankshaft and flywheel.

2—Show correct method of aligning pistons with crankshaft to show bent connecting rod or bearing out of alignment with shaft.—A. D. Stuelem, Square Deal Garage, Peotone, Ill.

1—In answering question with regard to crankshaft balancing we shall refer to static balance, which means that the shaft is balanced when it is standing still. Fig. 7 shows a piece of mechanism in static balance. It will remain in any angular position in which it is placed, and the centrifugal force on one arm is exactly equal and opposite in direction to that of the other. The first thing necessary is to balance the shaft without the flywheel, this can be accomplished by placing the shaft on knife edges, and if the shaft is in perfect static balance it will come to rest in any position. After the shaft has been placed in balance the flywheel can be bolted to the shaft and the balance again tested. A method for balancing crankshafts which has been used in some manufacturing plants is to suspend the crankshaft by a cord and set it into rotation. If the shaft is in dynamic balance it will find its center and run through but if out of balance it will wobble.

2—When new bearings have been fitted in an engine it is necessary to check up on the alignment of the crankshaft and pistons. If the parts have been removed from the engine, the connecting rods and piston pin bearings can be checked up by the method shown at the left in Fig. 7. Here two V-blocks, A, have been placed on a surface plate and the rod supported on a mandrel, B, which has the same diameter as the crankpin on the crankshaft. Needless to say the mandrel must be perfectly true if accurate results are to be had. The design of an engine makes it imperative that the top of the piston be parallel at all times with the center line of the crankshaft, hence if a height gage fitted with pointer is placed on the surface plate the pointer should touch equally the straight edge on the piston at all positions.

If the pistons and rods are in position on the engine the alignment easily can be tested as shown in the lower part of the illustration. The top surface of the joint between crankcase and block is planed perfectly true so that if a square is placed on it and against the pistons it will indicate whether everything is lined up correctly. The same rule holds on other engines, but sometimes a deviation has to be made on account of local conditions. This method of aligning will prove very satisfactory. However, there are a few concerns manufacturing jigs and gages which permit lining up connecting rods, pistons and crankshafts much quicker, and with greater accuracy than the method described.

REBUILDING FORD ENGINE

Q—Desire to rebuild a Ford engine for shop use into two cylinder engine. What cylinders should be used and also what kind of timer?—Wm. Haith, Peru, Neb.

It is far beyond our appreciation to see how you expect to make a two cylinder engine out of a four cylinder engine and get satisfactory operation. As it is now, the Ford engine develops only about 18 horsepower when running at its maximum speed. If you wish to use a Ford engine for stationary work it is advisable to leave it as it is and either direct connect or belt the machines you desire to run. Should you find that you cannot use the clutch assembly it will be necessary to provide an idler pulley so that the engine will not be forced to start under load.

LOOSE MAIN BEARINGS

Q—A 1919 Chevrolet 490 has a knock which sounds like a wristpin knock, when it runs idle. The wristpins have been examined and they seem to be tight. Sometimes it is louder than others; it also has a drumming noise on higher speeds or hard pulls when in sand and going up hill, or when the weather is heavy and damp, it sounds worse than at other times. Frequently when the engine is warm there is no noise and if it stops and is started over again it would knock and drum. It also has a grinding sound occasionally. Where could the trouble be found in the carbureter, ignition piston. I find the knock on No. 3 piston.—Barney Switzer, Michigan City, Ind.

From your description of the pound in the engine we are inclined to believe that it is a case of loose main bearings. In many cases the pound is heavier at the explosion of one cylinder. It is possible that the flywheel is loose but this very seldom occurs. If you will listen very carefully you will discover that a loose main crankshaft bearing will produce a double pound which occurs almost simultaneously.

Should this be the trouble it will be necessary to take up these bearings or if found badly worn it will be necessary to replace them. The grinding noise may or may not be in the engine. Perhaps it is the timing gears or the transmission. If the bearings in the transmission become badly worn so that the transmission is thrown out of line, a continuous grinding will be heard all of the time. If this is the case the bearings will have to be replaced and it is very probable that the transmission assembly may have to be raised slightly at the front end by the use of shims.

COMPRESSION

Q—For the present day gasoline is high or low compression better?

2—How is either brought about?—John T. Rosa, Detroit.

1—With the present grade of fuel low compression operates better and without the objectionable knock. However, reducing the compression to eliminate the fuel knock is a poor policy as far as power is concerned for the engine horsepower is cut down in large proportions by a small lowering of the compression. It is found that a compression of 65 lb. per sq. in. is very well suited to present day conditions. Higher than this is apt to cause the engine to knock, unless certain features are observed in the design which help to a material degree in the elimination of the fuel knock.

Mr. Horning of the Waukashaw Motors Co. has been able to secure very satisfactory results with as high a compression pressure as 85 lb. per sq. in. which gives him very good efficiency, food fuel economy and eliminates the knock. Some of the factors that enter into the combustion chamber design in this respect are the location of the spark plugs, the shape of the chamber, and the contour of the surfaces. It is found that best results are obtained when no surface in the combustion chamber is parallel to any other surface.

2—Low compression is obtained by making the clearance of the combustion chamber relatively large; and when a high compression is wanted, making it small. Thus if the piston displacement for one cylinder is 75 cu. in. and a compression pressure of 85 lb. is wanted the clearance volume when the piston is at upper dead center would have to be about 16 cu. in.

ENGINE KNOCKS

Q—We are unable to find the knock in a 1919 Auburn Beauty six equipped with a Continental engine. This engine has been torn down three or four times and all the bearings tightened and new piston pins put in but it knocks just the same.

The car has been driven 3,200 miles. This is a clattering knock that shows up at 28 miles an hour and continues as long as we run it over that rate and feed it gas, when the gas is shut off it seems to stop. It does not knock on a slow hard pull. If the third cylinder is shorted it causes a double knock.—G. E. Fleming, Bogard, Mo.

It is very likely caused by a loose wrist pin. The fact that when the spark plug is short circuited you get a very bad knock verifies the first statement. One of the best tests for a loose wrist pin when it is not possible to feel for the looseness is to short the plugs one at a time while the engine is running which will cause the engine to miss. When doing this if the piston pin is loose there will be a very noticeable knock. There is also a possibility that you have a piston slap. This may be due to improper fitting or perhaps the connecting rod has been sprung.

OIL PUMPING

Q—What makes a 1917 Ford car pump oil? The car has been driven 16,000 miles, and last spring was fitted with .0025 oversize pistons and new Ford rings. The correct side of the ring is up and have always used the best grade of oil but the car still carbons badly. Is it possible that the cylinders have worn egg shaped to prevent the rings from fitting properly? The car seems to have plenty of power when the carbon is first cleaned out.—O. J. Hartler, Day & Night Garage, Harrisonville, Mo.

If the cylinder block was not rebored or reground at the time the new pistons were fitted it is very probable that the cylinder walls are so badly worn that oil pumping is taking place. It is to be remembered, however, that this rapid accumulation of carbon can not be attributed to oil pumping alone but too rich a gasoline mixture and dirt that comes into the cylinders with the gasoline and also through the air intake as well.

ESSEX OILING SYSTEM

In the August 12 issue of MOTOR AGE regarding the lubrication of an Essex it was stated that the oil pump stroke should be set at 1/32 inch. A recent change made in the Essex oiling system necessitates that the minimum allowable stroke for driving should be 3/32 in. If the car is to receive extreme driving the stroke should be set at ⅛ in.

LOSS OF POWER

Q—A 1920 Dodge uses a gallon of oil to each 200 miles. The car has been run about 8,000 miles. The carbon has been cleaned out once. The plugs do not foul, and the crankcase gaskets do not leak. What causes this car to use so much oil?

2—A 1919 Olds Six has no power. It hits on all cylinders. The exhaust sounds unusually loud with the cutout open. It sounds and feels like late timing but the engine does not get unusually hot. The spark timing is O. K., but the valve timing has not been checked.—R. L. Mangnall, Tonica, Ill.

1—If there are no leaks, as you say, it is very probable that the pistons are at fault. Measure the clearance. In some cases, although it is not very common, new cars when received from the factory require attention due to the fact that the pistons have not been properly fitted. This being the case we advise having new pistons and rings fitted.

2—Loss of power is probably not due to one thing but to a number of things, each contributing in proportion to its importance. The factors that might cause this condition are, loss of compression, deranged valve action, faulty ignition, improper carburetion. The last two mentioned can be eliminated because if there was anything radically wrong with these two factors it is very probable that the engine would miss.

Loss of compression is the most logical cause for the trouble. Loss of compression means more than simply failure to compress the charge a specific amount; there is not only a low initial compression and consequent weak explosion, but there is also a smaller charge taken into the cylinder, and a portion of the diminishing charge escapes during the compression stroke without doing even a small amount of work, and that a part of the explosive force escapes through unauthorized channels. Faulty compression comes from a variety of sources; cylinders may be worn, scored or cracked; rings become gummed, worn or broken; valves need grinding, their stems are sometimes bent so that the valves cannot seat perfectly, or the stems and guides are considerably worn.

Leaks often occur around spark plugs and valve caps but are readily found by applying oil while engine is running and noting if bubbles appear. If you have not taken the engine down we do not see how it is possible to have the valve timing change so as to give you this loss of power. The best thing to do is to check up the things mentioned and see if this will not remedy the trouble. It might be advisable to examine the battery as a weak battery may aid in giving the above described condition.

WORN TRANSMISSION BANDS

Q—Instruct how to remedy a jerking, grabbing and sudden releasing of the clutch in a 1920 model Ford. New transmission lining was installed and the clutch was adjusted. This is noticeable only when pulling hard in high or changing speed.—G. M. Newpart, Carlisle, Ark.

Regardless of whether you have relined the transmission and adjusted the clutch or not the trouble is undoubtedly due to worn or glazed transmission band lining or improper adjustment of the clutch. When using the low gear, many drivers unconsciously relax the pressure on the pedal so that the drums slip and wear the bands. Our suggestion is that you examine the linings and see that the adjustments are properly made. The bands should be adjusted so that the pedals can be pushed down to within a couple of inches of the floor boards, before the bands grip tightly.

LOCATING COMPRESSION LOSS

Q—Instruct how to determine whether new pistons or rings only are necessary in cases where compression is low.

2—What compression should an eight-cylinder model 45, 1918 Oldsmobile have?

3—How much clearance should aluminum piston and piston rings have?—H. E. Borns, Newark, N. J.

1—First make a thorough examination of the valves and if found in good condition and seating tightly you can assume that the loss is due to the condition of the cylinders, pistons and rings. If there is a decided loss of compression, due to wear of the pistons and rings, you will find upon examination that there is excessive clearance and in all probability the pistons will be pumping oil.

The oil pumping condition can readily be determined by removing the spark plugs. If they foul frequently and carbon accumulates very quickly it is a very good indication that the pistons are pumping oil. Another good way to tell if there is air getting by the pistons is to place your ear close to the breather tube and then have some one turn the engine over by hand. If the pistons are so loose that losses are occurring, the air getting by the pistons can be heard very easily when the piston is on the compression stroke.

2—The compression which is being used in most engines at the present time is about 65 to 70 lbs.

3—There is some question as to just what the clearance should be. An interesting account of a test on aluminum pistons conducted recently on the Indianapolis track was published in the Aug. 26 issue of MOTOR AGE.

At present it seems that the clearance that will give the best results is dependent to a great extent upon the construction of the piston and the composition of the alloy. Some manufacturers recommend one clearance and others, another. However, if you will refer to page 19, April 15 issue of MOTOR AGE, you will find recommended clearances for both aluminum and cast-iron pistons that will give very satisfactory results.

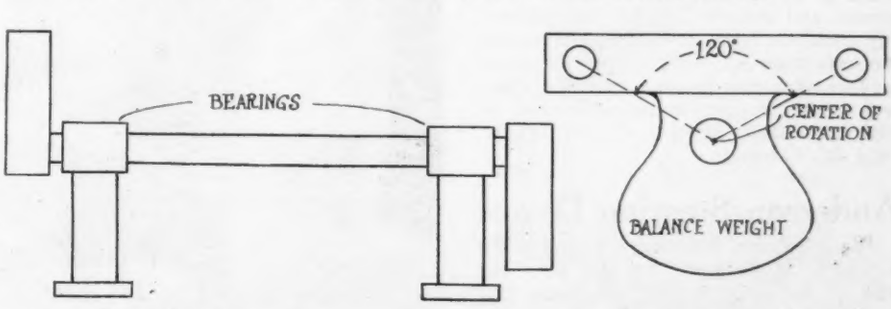


Fig. 8—If a shaft is in static balance it will rest in any position. The shaft illustrated would not be in dynamic balance

The Accessory Show Case

New Fitments for the Car

Igo-Vertical Bumper

The Igo-Vertical Bumper is designed to overcome the difficulties of bumpers to either over-ride or run under each other, due to the various types of automobile chassis, and consequently varying height of the bumper from the ground. Two vertical loops made of spring steel offer a vertical contact area of 15 in., sufficient to take care of the varying heights of all other straight channel bar bumpers. The illustration shows the effectiveness of this arrangement even where the cars are at an angle.

Another feature of this vertical loop and the method which is used in securing the bumper to the frame is that it is possible to get the car up by placing a jack underneath the lower curve of either vertical loop. The channel bar is made of rolled rail steel and is protected from becoming permanently bent as the result of small shocks by means of a small coil spring. The bumper is equipped with adjustable bracket reenforced by a rib which prevents the bumper from bending when the car is raised, and permits placing the bumper any distance from the wheels to insure the ends from not engaging the wheels or fenders of a car passing in close quarters. The bumper is manufactured by The Igo Safety Bumper Co., at 149 W. Ohio St., Chicago.

Duntley four unit timer

Anderson Steering Device

The Anderson Steering Device, shown herewith, is designed for the Ford car and it is claimed will eliminate lost motion and prevent the vibration at the wheel. It is also claimed to eliminate wobbling of the front wheel. This device is composed of a rather heavy coil spring which is attached just ahead of the drag link connection at one end and to a casting which is bolted to the axle at the other. This device is manufactured by the Motor Device Co., Anderson, Ind. It lists at $3.50.

Wood's Ford transmission lock

Wood's Everloc

Wood's Everloc is a Ford transmission lock. It is claimed that when the device is in locked position it is impossible to remove it even if the thief removes the six screws in the plate. The engine can run but the car cannot move. When installing, remove transmission cover by taking out the six screws, insert small end lock in first place, so that lip hooks under transmission housing. See that the lock is in an unlocked position. Cut slot out of the floor board at proper location which is easily found by placing the floor board in position after lock is installed.

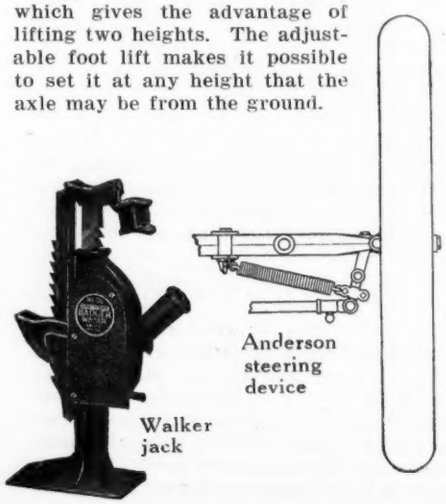
The illustration shows it in unlocked position. It has been recommended by the Insurance Underwriters and is listed at $10 by the W. C. Wood Co., 105-7 Western Ave., Minneapolis.

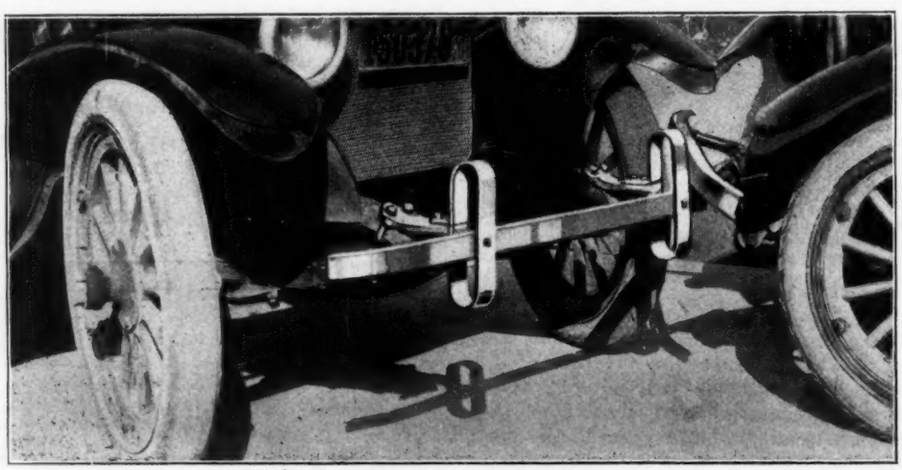
Duntley Four Unit Timer

The new Duntley Four-Unit Timer illustrated has just been placed on the market by J. W. Duntley of Chicago. It is built so that it will readily fit the Duntley wire and terminal guard. This timer has no adjustments. The illustration clearly shows the simple and sturdy construction. No cam is used in this timer. The contacts are carried on the surface of the revolving armature and as it revolves, the proper connections are made.

Walker Jack

The Jack illustrated is known as the Badger. It is one of the products of the Walker Mfg. Co., Racine, Wis. It is equipped with a double cap which gives the advantage of lifting two heights. The adjustable foot lift makes it possible to set it at any height that the axle may be from the ground.



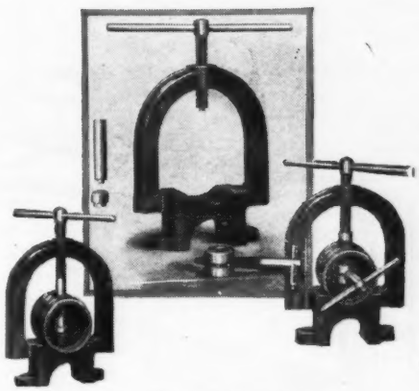


Igo vertical bumper

Service Equipment
Time Savers for the Shop

Piston Bushing Press

The Stevens Piston pin bushing press designed for use when repairing Fords will be found very valuable as a time saver as well as an aid in doing a neat job with a light weight piston. This press removes and inserts the bushing without any danger of breaking or marring the piston, and it is claimed will drive the bushing to the exact depth without any misaligning or burring. The complete tool consists of the expanding block of the base, the yoke and the T-handle screw. The tool is completed by the plunger and the punch. Stevens & Co., manufacturers of this press, state that the dealer cost will be about $15 net f.o.b. Toledo or New York City.



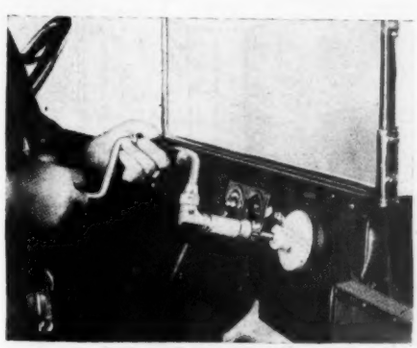
Piston bushing press

Valve Seat Facer

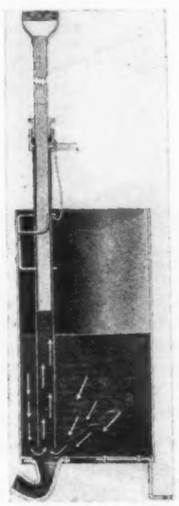
The valve seat facer shown herewith is known as the Hoerner Adjustable Valve Seat Facer. The cutters are made of tool steel, properly tempered, and it is claimed are as strong and accurate as a solid facer. The pilot stems are interchangeable and will fit any size valve stem accurately. It is distributed by Bernard & Longstaff, 20 E. Jackson Blvd., Chicago.

Rotary Hack Saw

The Misener Rotary hack saw, illustrated herewith, is a very serviceable tool which will save time and labor when used for cutting holes for the installation of speedometers and other instruments on the dash. It is a tool that is adaptable for use with both a hand brace or an electric drill. By grinding worn blades to a knife-like edge it is possible to use this device for a gasket cutter as well. It is manufactured by Barnes & Erving, Syracuse, N. Y., and sells complete with bite brace shank, without blades, for $12.



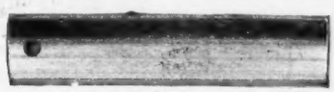
Rotary hack saw



Wood's grease injector

Taber Bearing Scraper

A new scraper known as the Taber Everlasting Bearing Scraper has recently been placed on the market by Taber Mfg. Co., 2227 Woolsey St., Berkley, Cal. The scraper is made of a high speed steel blade which is fastened securely to a bronze back, the whole being nicely nickel-plated and mounted in a Birch handle. The claim is made that this scraper will hold an edge longer than any other scraper made. The retail price is $1.75.



Valve seat facer

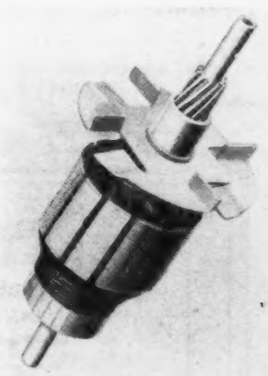
Taber bearing scraper

The Hole Shooter

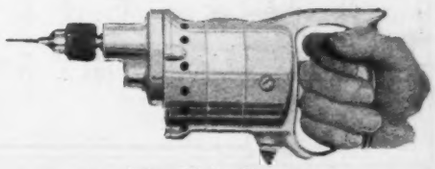
The Hole Shooter is a light weight compact electric drill, weighing only 3¼ lbs. It is particularly adapted for body work, dashboard drilling and installing accessories. The gears used in its construction are nickel-alloy steel and run in grease in an oil-tight compartment. The front end of the spindle shaft is carried on ball bearings. The motor is universal type, 110 volt, operating in either direct or alternating current. Thirty-two and 220-volt windings can be furnished on special order. The current is controlled by Cutler-Hammer push button switch in upper part of revolver grip. A Jacobs chuck is also provided as part of the equipment. This drill is manufactured by A. H. Peterson Mfg. Co., Milwaukee, Wis.

Wood's Grease Injector

The Wood's Injector, illustrated herewith, pumps heavy engine oil and grease measuring one-quarter pound of grease at each stroke of the plunger. It holds twenty-two pounds of grease and operates with one hand. The container and cover are made of 24 gage metal and the bottom is re-inforced with a cold roll steel plate. The barrel is of 20-gage welding steel tubing and screws into stuffing box which is machined from steel. Its operation is a valveless action which cannot be clogged by small chips, pieces of waste, etc. It is manufactured by the A. J. Wood Mfg. Co., Grand Rapids, Mich. and sells for $7.



Armature of the Hole Shooter



The Hole Shooter

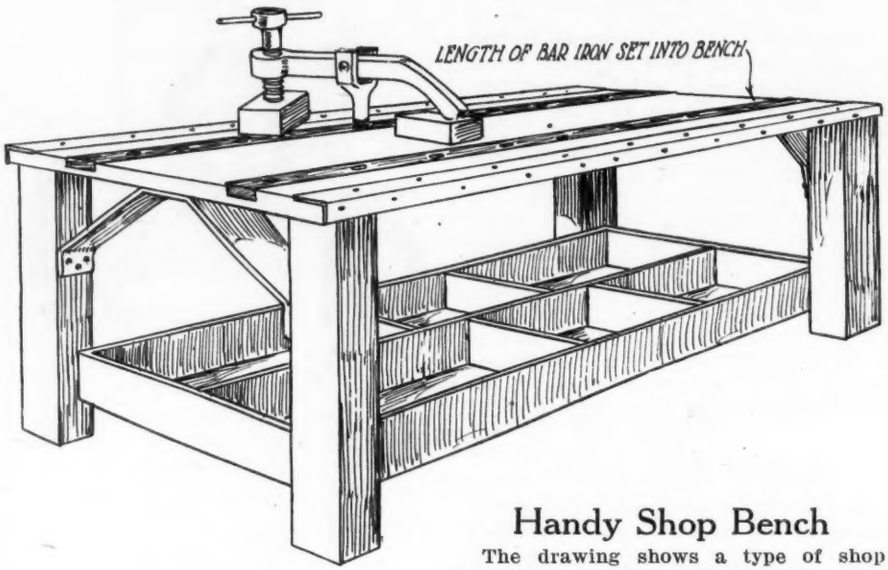
The Automotive Repair Shop

Practical Maintenance Hints

Foot Pressure for the Hand Drill

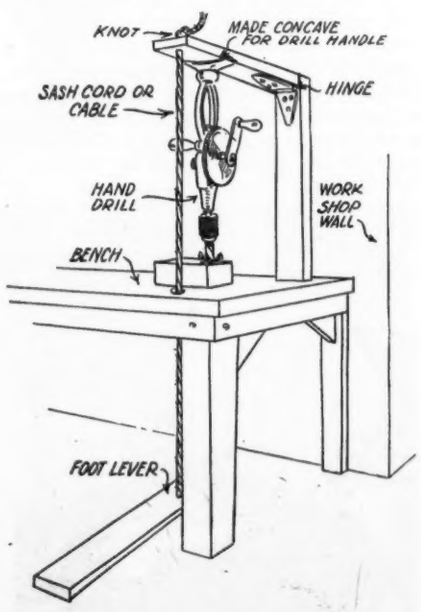
A simple device that expedites drilling with the hand drill is shown in the attached sketch. A hand drill requires the maximum of effort where steel or thick sections of brass are to be drilled. The foot attachment shown, which is suitable for garage or repair shop work, makes this laborious task far easier as regards effort and additionally holds the drill upright and steadies it.

This attachment consists only of a strap hinge, two sections of plank and a piece of cable or sash cord with a piece of board at the lower end for the foot. A concave cut in the hinged section is provided for the upper end of the drill. One foot on the lower board gives or applies pressure to the drill point leaving both hands free to operate the drill and hold the piece being worked on.



Handy Shop Bench

The drawing shows a type of shop bench that could be well adopted by more shops. It is a home-made affair and costs but little to construct. It should be of rugged lumber. The feature of this bench is that any sort of work can be bolted down in a handy manner for easy access for the required work. Two or more lengths of iron bars are set into the top of the bench and a series of holes drilled and tapped into these to take the bolts for holding down the work, or if preferred, bench clamps of the sort shown can be made and used.



Device for applying foot pressure to the hand drill which will save much tiresome labor

Construction of a Spray Cleaning Device

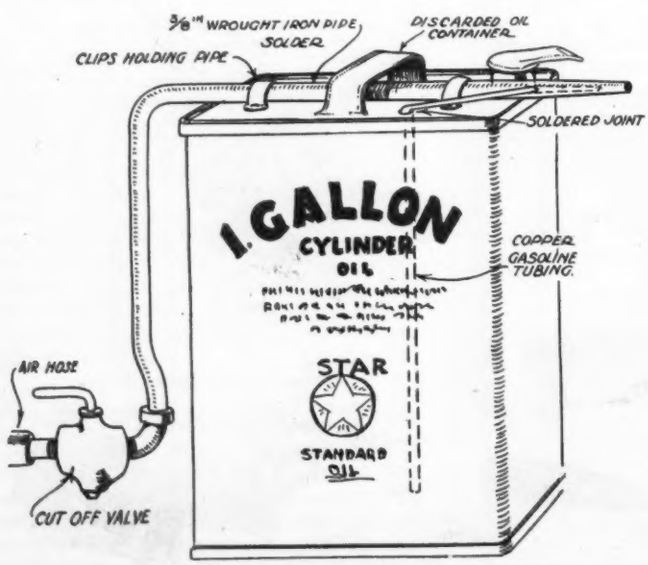
One of the details of proper care of a motor car is that of cleaning the engine and adjacent parts of the collection of oil and grease.

Inasmuch as a grease soaked engine and drip pan invites fire with the possible loss of the car, this item is quite important.

In the sketch shown is a kerosene sprayer, the several parts of which are obtainable in the usual private garage as discarded materials. The body of this sprayer is a gallon oil can, the nozzle a piece of ⅜ in. wrought iron pipe and the kerosene is led through this by means of a piece of gasoline leading from the bottom of the kerosene container. The pipe is arranged as shown to serve as a handle with a cutoff valve conveniently placed.

The hose is either connected to an air tank or an air compressor, if one is available in the garage or arrangements can be made at a tire station to use their source of air supply for a nominal sum.

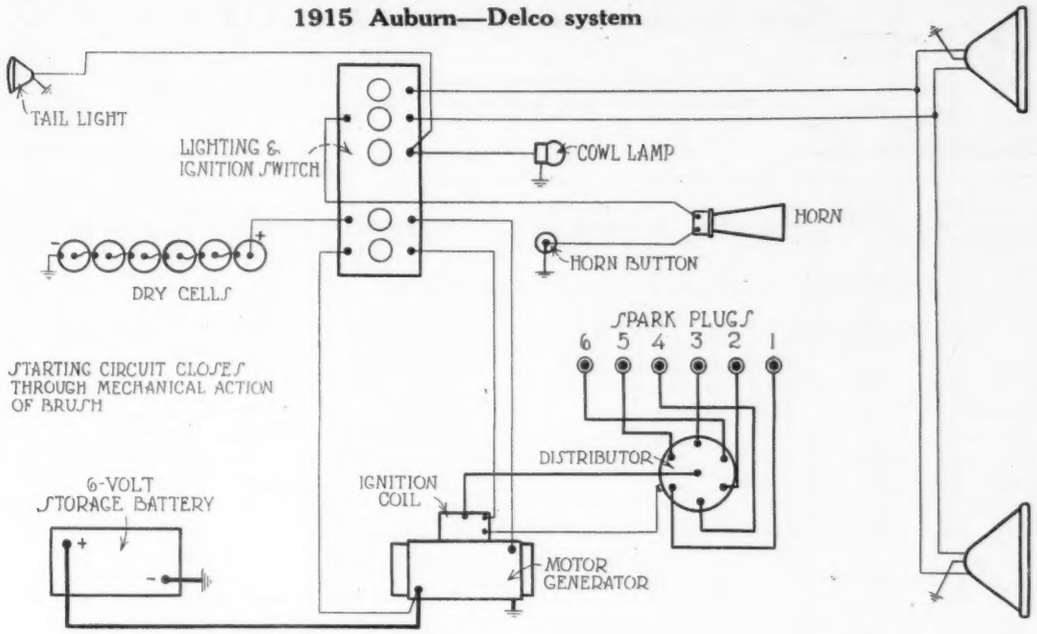
Either kerosene or gasoline can be used in the reservoir, and the end of the spraying tube should be flattened down so that a very fine stream of oil issues from it when the air is turned on. This stream of oil with the compressed air behind it will cut the dirt from the engine like a knife with very little attending dirt to inconvenience the owner. The gasoline or kerosene rapidly evaporates, leaving the engine spotlessly clean.



Engine and parts cleaning sprayer

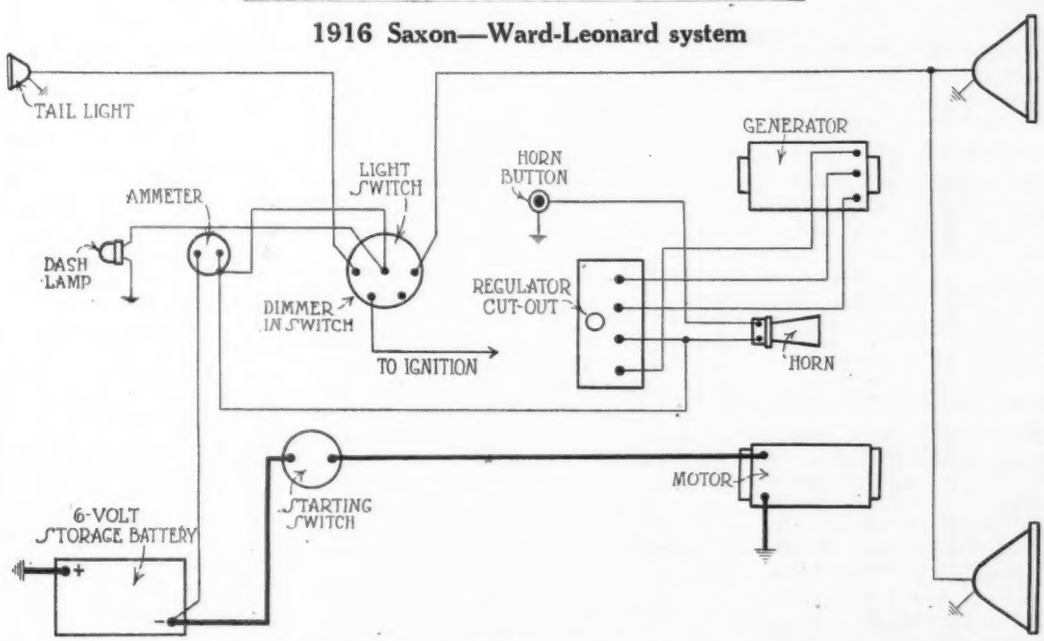
Motor Age Weekly Wiring Chart No. 94

1915 Auburn—Delco system



1915 AUBURN 6-40 DELCO SYSTEM

1916 Saxon—Ward-Leonard system



1916 SAXON S-2 WARD-LEONARD SYSTEM

Name of car and date on which wiring diagrams have appeared in previous issues

Allen—June 17, '20
Apperson—Aug. 5, '20
Briscoe—May 6, '20
Buick—July 15, '20
Case—Aug. 5, '20
Chalmers—June 17, '20
Chandler—May 20, '20
Cole—June 10, '20
Crow-Elkhart—July 29, '20
Davis—Aug. 12, '20—Sept. 2, '20
Dort—Aug. 12, '20
Elcar—May 6, '20
Franklin—June 3, '20
General Battery Charging—Sept. 15, '19
General Magneto Diagram—June 15, '19
Grant—Aug. 12, '20
Harroun—July 15, '20
Haynes—June 24, '20
Hupmobile—May 27, '20
Internal Connections — July 10-17-24, '19
Jeffery—May 13, '20
Jordan—June 10, '20—July 22, '20
King—May 20, '20
Kissel—May 27, '20 — Aug. 19, '20
Lexington—July 29, '20
Locomobile—June 3, '20
Moline-Knight—May 20, '20—July 22, '20
Moon—July 29, '20 — Aug. 19, '20—Sept. 2, '20
Peerless—May 13, '20
Pierce-Arrow—July 15, '20
Reo—July 22, '20
Roamer—Aug. 5, '20
Scripps-Booth—Aug. 26, '20
Studebaker—July 1, '20
Stutz—July 8, '20
Special Systems for Fords—May 15-22, '19

Gear Ratios for 1920 Passenger Cars

Motor Age Maintenance Data Sheet No. 113

One of a series of weekly pages of information valuable to service men and dealers—save this page

Name and Model	First Speed	Second Speed	Third Speed	Fourth Speed	Reverse	Rear Axle Gear Ratio
Argonne, 1920	2.8	1.83	1.	1.	3.0	3.875
Ace, TL	3.24	1.63	1.	.....	4.5	4.45
Allen, Series 43	2.85	1.71	1.	.....	4.	4.63
American, C 6	3.52	1.73	1.	.....	3.96	4.5
American Beauty, 6-55	3.2	1.875	1.	.....	3.88	4.9
Anderson, 30	3.9	1.856	1.	.....	3.87	4.5
Apperson, 821-8	3.43	2.04	1.	.....	4.75	4.25
Apperson, Anniversary	3.43	2.04	1.	.....	4.75	4.25
Auburn, 639 H-K	2.985	1.733	1.	.....	3.903	4.666
Bell						
Bour-Davis, 21 S	2.77	1.66	1.	.....	3.6	4.55
Brewster, 1920	3.45	1.64	1.	.....	4.28	4.25
Briscoe, 4-34	2.86	1.7	1.	.....	3.57	4.18
Buick, K6-45	3.36	1.76	1.	.....	4.32	4.08
Buick, K6-49	3.36	1.76	1.	.....	4.32	4.61
Cadillac, 59	3.12	1.70	1.	.....	3.74	4.437
Case, V	2.985	1.733	1.	.....	.....	4.454
Chalmers, 6-30	3.38	1.93	1.	.....	4.51	4.75
Champion, C4						4.50
Chandler, 27	2.985	1.733	1.	.....	3.903	4.4
Chevrolet, 490	3.32	1.77	1.	4.2	.....	.....
Chevrolet, FB	3.525	1.736	1.	3.96	.....	.....
Cleveland, 40	3.07	1.76	1.	.....	4.01	4.45
Cole, 870	3.32	1.83	1.	.....	4.35	4.454
Columbia, D-C and C-8	3.09	1.85	1.	.....	3.87	4.75
Comet, C-53						
Commonwealth, 42	3.	1.89	1.	.....	3.62	4.25
Crow-Elkhart, L55-4	3.66	1.91	1.		4.46	4.25
Crow-Elkhart, H55-6						
Cunningham, V-4	3.35	1.86	1.	.....	4.93	4.083
Daniels, D	3.1	1.6	1.	.....	3.8	4.4
Davis, 51-55	3.525	1.736	1.	.....	3.966	4.75 (Salisbury) 5.09 (Timken)
Dispatch, G	15.	9.	15.	.....	15.	4.12
Dixie Flyer, H.S-70	3.	1.89	1.	.....	3.6	4.81
Dodge Brothers	4.89	1.91	1.	.....	4.89	4.166
Douglas	2.77	1.57	1.	.....	3.4	4.50
Dorris, 6-80	3.04	1.81	1.	.....	3.7	.....
Dort, 15	3.4	1.96	1.	.....	4.45	4.07
Du Pont, A	3.29	1.81	1.	.787	3.94	4.454
Economy, 646						
Elcar, 6	3.4	1.7	1.	5.1	.....	.....
Elcar, 4	2.5	1.7	1.	3.4	.....	.....
Elgin, K	3.07	1.77	1.	.....	4.	5.1
Essex, A	3.07	1.75	1.	.....	3.97	5.09
Ferris, C-20	2.985	1.73	1.	.....	3.903	4.66
Ford, T	2.74	1.	.....	.....	4.00	3.636
Franklin, S-9-B	3.11	1.76	1.	.....	3.37	4.333
Geronimo, 6-E-45	2.98	1.73	1.	.....	3.9	4.25
Grant, HX	3.095	1.851	1.	.....	3.869	4.6
Gardner, 1920	3.40	1.96	1.	.....	4.45	4.416
Hanson, 54	2.71	1.57	1.	.....	3.54	4.75
Harroun, AA-2						
Haynes, 45	3.33	1.82	1.	.....	4.35	4.77
Haynes, 47	3.33	1.82	1.	.....	4.35	4.77
Huffman Six, R	3.66	1.91	1.	.....	4.46	4.50
H. C. S	3.04	1.81	1.	.....	3.7	4.
Hollier, 206-B						
Holmes	3.33	1.68	1.	.....	4.35	4.9
Hudson Super-Six, O	3.04	1.81	1.	.....	3.67	4.9
Hupmobile, R	2.99	1.895	1.	.....	3.63	4.875
Jackson, 638	3.66	1.91	1.	.....	4.46	4.75
Jones, 28	2.98	1.73	1.	.....	3.9	4.5
Jordan, M	3.2	1.72	1.	.....	3.88	4.666
King, H	3.198	1.875	1.	.....	3.883	4.875
King, Road King	3.198	1.875	1.	.....	3.883	4.08
Kissel, 45	3.24	1.63	1.	.....	4.05	3.92
Klinekar, 6-55-J	2.98	1.73	1.	.....	3.90	4.56
LaFayette	3.04	1.705	1.	.....	3.66	4.5 / 4.9
Leach, B-W	3.33	1.68	1.	.....	4.35	4.224
Lexington, S20	3.24	1.63	1.	.....	4.05	4.62
Liberty Six, 10-C	3.2	1.875	1.	.....	3.88	4.66
Locomobile, 43	4.0	1.5	1.25	1.	5.12	3.85
Lorraine	3.0	1.89	1.	.....	3.62	4.5 / 4.75
Madison, 19 S 9	2.5	1.7	1.	.....	3.40	4.41
Maibohm, B	2.6	1.7	1.	.....	3.4	4.5
Marmon, Closed Cars, 34 B	3.35	1.53	1.	.....	3.15	4.1
Marmon, Touring 34B	3.36	1.6	1.	.....	4.32	3.75
Maxwell, 1920	4.75	2.04	1.	.....	7.12	3.58
McFarlan, 127	3.361	1.50	1.	.....	4.43	3.0 / 3.5
Mercer, Series 5	3.75	2.1	1.4	1.	3.2	3.81
Meteor, K and R						
Metz, M6	3.342	1.665	1.	.....	4.178	4.66
Mitchell, F-40	3.29	1.7	1.	.....	4.6	4.42
Monitor, S-3						
Monroe, S-9 and S-10	2.6	1.7	1.	.....	3.4	4.818
Moon, 6-48	3.3	1.6	1.	.....	4.1	4.667
Moon, 6-68	3.3	1.6	1.	.....	4.1	4.667
Moore, 30 G	3.	1.89	1.	.....	3.62	4.75
Nash, 681-2-3-4-5-6	3.24	1.8	1.	.....	4.3	4.5
National Sextet, BB	3.3	1.68	1.	.....	4.35	4.08
Nelson, D	4.25	1.5	1.	.....	4.16	4.25
Noma, IC	3.2	1.72	1.	.....	3.88	4.45
Norwalk, A 30 K						
Oakland, 34-C	3.53	1.74	1.	.....	3.97	4.5
Ogren, 6-60	2.6	1.7	1.	.....	3.4	4.1
Oldsmobile, 45-B	3.36	1.76	1.	.....	4.32	4.90
Oldsmobile, 37-A	3.09	1.73	1.	.....	3.98	4.57
Olympian, 45	2.98	1.9	1.	.....	3.66	4.636
Overland, 4	3.62	2.03	1.	.....	4.83	.....
Owen Magnetic, 60	Electric Transmission					4.5
Packard, 335	3.41	1.66	1.	.....	4.3	4.36
Paige, 6-42	2.925	1.6363	1.	.....	3.9	4.5
Paige, 6-55	2.925	1.6363	1.	.....	3.9	4.33
Pan, A	3.0	2.0	1.	.....	4.0	4.9
Paterson, 647	3.	1.856	1.	.....	3.87	4.5
Peerless, 56	3.33	1.68	1.	.....	4.35	4.9
Piedmont, 6-30						
Piedmont, 6-40	2.985	1.733	1.	.....	3.903	3.454
Pierce-Arrow, 31	3.88	2.22	1.76	1.	4.66	3.53
Pierce-Arrow, 51	4.	2.15	1.65	1.	4.93	3.78
Pilot, 6-45	2.61	1.7	1.	.....	3.4	4.45
Porter, 46-A	3.4	1.97	1.36	1.	4.37	3.
Premier, 6-D	3.2	1.875	1.	.....	3.88	4.5
R. & V. Knight, R	3.33	1.68	1.	.....	4.35	4.75
R. & V. Knight, J	3.33	1.68	1.	.....	4.35	4.9
Reo, T-6	3.68	1.8	1.	.....	5.	4.666
Revere, C	3.66	2.0	1.33	1.	4.	3.
Roamer, C-6-54	2.71	1.57	1.	.....	3.547	3.84
Roamer, D-4-75						
Saxon, 125	3.61	1.82	1.	.....	4.5	4.75
Sayers Six, SP	2.98	1.73	1.	.....	3.9	4.75
Scripps-Booth, B-39	3.52	1.73	1.	.....	3.96	4.5
Seneca, L20	3.044	1.234	1.	.....	3.625	4.750
Severin Six	2.77	1.66	1.	.....	3.6	4.50
Singer, 20	3.67	1.60	1.	.....	4.37	3.76
Skelton, 35	3.67	1.60	1.	.....	4.37	4.50
Spacke, S 20	1.62	.....	1.62	.....	2.0	5.0
Standard, I	2.84	1.62	1.	.....	3.65	4.46
Stanley Steamer	.....	.....	.....	.....	.....	1.0
Stearns, SKL4	3.01	1.66	1.	.....	3.7	4.5
Stephens, 80	3.24	1.66	1.	.....	4.16	4.75
Studebaker, EJ-40						
Studebaker, EH-50	3.65	1.69	1.	.....	4.77	3.7
Studebaker, EG-60	3.65	1.69	1.	.....	4.77	3.7
Stutz, H	2.64	1.61	1.	.....	3.5	3.5
Templar, A-445	3.23	1.72	.....	.....	3.88	4.4
Texan, A-38	2.91	1.89	1.	.....	3.62	4.27
Tulsa, E-1	2.6	1.7	1.	.....	3.4	4.5
Velie, 48	3.09	1.856	1.	.....	3.87	4.66
Velie, 34	3.09	1.856	1.	.....	3.87	4.72
Vogue, 655						
Vogue, 666						
Wasp	2.69	1.56	1.	.73	3.46	3.7
Westcott, C-48	3.66	1.81	1.	.....	4.58	4.45
Westcott, C-38	3.24	1.63	1.	.....	4.05	5.09
Willys-Knight, 20	3.66	2.03	1.	.....	4.71	5.0
Winther, 61	3.24	1.64	1.	.....	4.05	4.45
Winton, 25	3.29	1.6	1.	.....	3.94	4.9

The columns headed "First Speed," "Second Speed," "Third Speed, "Fourth Speed," and "Reverse" are transmission ratios. These should not be confused with total gear reduction which is the product obtained by multiplying rear axle ratio by the transmission ratio. Example: Total reduction of Cadillac in first speed is 3.12 × 5.071 = 15.82.

Law in Your Business

By Wellington Gustin

The Law in Regard to Garages as a Nuisance

New York Court Says They Are a Necessary Industry and Are Not Objectionable in Residential Districts When Conducted Carefully

IT HAS been asked whether a garage may be restrained from continuing noises and producing obnoxious odors when conducted in certain localities and the underlying principles may be well worth stating here. Under proper conditions such may become a nuisance and the garage owner may be restrained, the injunction being made so severe as to practically prohibit the operation of the garage. But a public garage is not in itself a nuisance. It becomes such by facts and surrounding circumstances. It may be a nuisance when conducted in a strictly residential neighborhood and it may become a nuisance through the manner in which it be conducted even in a strictly business section. It is a perfectly lawful and legitimate business, but it may be conducted in an unlawful manner thereby rendering it a nuisance.

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty problems as may be submitted to him.

A Necessary Industry

In an early case, a New York court says the garage is a necessary industry since the automobile has come to stay. The mechanism of motor cars is complicated, repairs must be made by skilled machinists, and cars must be housed. With the growth of business comes the adoption of new methods. The quiet of yesterday must yield to the advancing commercial activity of to-day. Hence the garage may encroach upon residential and the quieter business districts, where the evils of bad odors from the gases and oils and of noise are kept at a minimum. And it has been said that though a nuisance has been permitted to exist over a long period, still it may be enjoined.

The storage of gasoline or other dangerous explosives where imperfectly guarded in the vicinity of residences may be a nuisance. The garage keeper may be liable for all danger resulting from his storage of explosives. Where garages are located adjacent to dwelling houses, they are liable to become nuisances on account of the way in which they handle their gasoline, or through the quantity it stores on the premises. In any given case of explosion and fire, if the keeping of gasoline is in itself a nuisance, then the keeper is liable for all damages, regardless of the degree of care exercised in the keeping, but if such keeping is not in itself a nuisance, then the keeper's liability depends upon the want of care in the manner or place of keeping such explosives, or some other negligent act. A nuisance in itself is exemplified where more gasoline is kept or stored than is permitted by a city's ordinance or state statute. Gasoline has been held to be a highly explosive substance, and its handling and keeping falls within the law relating to other high explosives. It has been held that the maintenance in a city of gasoline in tanks does not, without more, constitute a nuisance. So, in general, whether the conduct of a garage is a nuisance depends upon the particular facts and circumstances surrounding each case.

Neighborhood Restrictions Considered

The erection or conduct of a garage may also depend upon another element, that of a restrictive covenant in a deed of the premises. This becomes important where a garage is sought to be located in a restricted neighborhood. As a garage is not in itself a nuisance, it has been decided that a deed forbidding the maintenance of a "nuisance," will not bar a garage. But in another deed there was a restriction against "any tavern, drinking saloon, slaughterhouse, skin-dressing establishment, or any other building for offensive purpose or occupation and the court held that a public garage is within the meaning of the restriction. In still another case it was held the business of the garage is offensive. Here an owner of land divided it into building lots, and in each deed inserted a restriction that the property should not be used for any business "offensive to the neighborhood for dwelling houses." A purchaser of one of these lots brought suit to enjoin the erection of a public garage on another. The court decided that the maintenance of such a building would constitute a violation of the restriction against carrying on an offensive business.

Regulated by City and State

Again, the public garage is of such a character of business enterprise as to justify regulation in its conduct and location, by the state, through its police powers in the interests of public safety. The regulatory power of state and city over garages will be discussed in another article.

HALE & KILBURN BUSINESS SOLD

New York, Sept. 6—Stockholders of the Hale & Kilburn Co. of Philadelphia to-day voted to sell the business in exchange for preferred and common stock of the American Motor Body Corp. which will be controlled by American Can Co. and Chase National bank interests. The Willys companies have been among the largest customers of Hale & Kilburn. Both the American Can Co., which will be represented on the new company by J. R. Harbeck, and the Chase bank are interested in the Willys interests.

WIN TRUCK MIRROR FIGHT

Louisville, Ky., Sept. 3.—A permanent injunction restraining the State Tax Commission from enforcing a law passed at the last session of the Legislature providing that owners of motor trucks be required to equip them with driving seat mirrors obtained from the commission has been issued by Judge Stout, in the Franklin County Circuit Court.

Motor Age Monthly Guide to Truck Specifications

These tables are revised and brought up to date monthly

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
A & B 3T	3	.....	48x3½d	48x3½d	Own	4-5 .17x4½	Bosch	none	none	Scheb	none	Own	in-g	Own	Gem
A & B 5T	5	.....	48x3½d	48x5d	Own	4-5 .17x4½	Bosch	none	none	Scheb	none	Own	in-g	Own	Gem
Acason R	1	$2,400	36x3½	36x5	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ross
Acason RB	1½	2,650	36x3½	36x6	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Marvel	Fuller	Fuller	worm	Timkn.	Ross
Acason H	2½	3,850	36x4	36x8	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Marvel	Detlaff	Cotta	worm	Timkn.	Ross
Acason L	3½	4,900	36x5	40x5d	Wauk.	4-4½x6½	Eise.	.....	Wauk.	Marvel	Detlaff	Cotta	worm	Timkn.	Ross
Acason M	5	5,850	36x6	40x6d	Wauk.	4-5x6½	Eise.	.....	Wauk.	Scheb.	B &B.	Cotta	worm	Timkn.	Ross
Acason Tractor	6	.....	36x4	36x7	Wauk.	4-4½x5½	Eise.	.....	Wauk.	Scheb.	B &B.	Cotta	worm	Timkn.	Ross
Acason Tractor	10	.....	36x5	40x5d	Wauk.	4-4½x6½	Eise.	.....	.....	M.&E	M.&E	Cotta	worm	Timkn.	Ross
Ace	1½	2,750	34x3½	34x5	Buda	4-4½x5½	A-K	West.	Pierce	Scheb.	M.&E	Cotta	worm	Timkn.	Ross
Ace	2½	3,450	36x4	36x7	Buda	4-4½x5½	A-K	West.	Pierce	Scheb.	M.&E.	Cotta	worm	Timkn.	Ross
Ace	3½	.....	36x4	36x7	Buda	.....	A-K	West.	G&D	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme B	1	2,175	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme F	1½	2,375	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme A	2	3,050	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	.....	Duplx.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme C	3½	4,050	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	.....	Cont.	Ray.*	B.&B.	Cotta	worm	Timkn.	Ross
Acme E	5	5,150	36x6	40x6d	Cont	4-4½x6	Eise.	.....	.....	Cont.	Ray.*	B.&B.	B.Lipe	in-g.	Russel	Jacox
Air.O.Flex C	1½	.....	36x3½	36x5	Buda	4-3½x5½	Wag.	.....	Pharo	Strom.	B.&B.	B.Lipe	in-g.	Torbn.	Lavn.	Gem.
All-American	1	1,795	33x4*	32x4	Simms	4-3½x5	Simms	none	none	Strom.	Detlaff	Cotta	in-g.	Torbn.	Lavn.	Gem.
All-American	1½	2,195	34x4	34x5	H-S	-3½x5	Simms	.....	.....	Strom.	Detlaff	Cotta	in g.	Torbn.	Lavn.	Gem.
All-American	2½	2,395	34x4	34x6	H-S	-3½x5	Simms	.....	.....	Strom.	Detlaff	Cotta	in g.	Torbn.	Lavn.	Gem.
All-American	3½	.....	36x6	36x10	Cont.	4-4½x5½	Eise.	West.	Mon.	Zenith	Detlaff	Cotta	worm	Timkn.	Ross
All-Power C	1	1,745	33x4	32x3½	Bdua	4-3½x5½	A-L	A-L	none	Strom.	Fuller	Fuller	in g.	Torbn.	Lavn.	Gem.
Apex C	1	1,915	32x3½	32x4	Buda	4-3½x5½	A-L	A-L	none	Strom.	Fuller	Fuller	in g.	Torbn.	Lavn.	Gem.
Apex D	1½	2,695	36x4	36x6	Buda	4-4½x5½	Eise.	Eise.	Duplx.	Strom.	Fuller	Fuller	in-g	Torbn	Lavn.	Gem.
Apex E	2½	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder HW	2½	.....	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Armleder KW	3½	.....	36x5	36x5d	Cont.	4-4½x5½	.....	West.	.....	Strom.	Fuller	Fuller	in-g.	Torbn.	Ross
Atco IG.10	1	.....	34x4½	36x6	.....	4-3½x5½	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlas	½	.....	.....	.....	.....	3½x5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atterbury 7CX	2½	3,375	36x4	36x4d	Cont.	4-4½x5½	Berl.	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury 7D	3½	4,175	36x5	40x5d	Cont.	4-4½x5½	Berl.	none	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Atterbury 8E	5	5,575	36x5	40x6d	Cont.	4-4½x6	Berl.	Delco	Cont.	Zenith*	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Autocar 21UF	2	2,300	34x4	34x5	Own	2-4½x4½	Bosch	none	none	Strom.	Own	Own	d-rd.	Own	Own
Autocar UG21	2	2,400	34x4	34x5	Own	2-4½x4½	Bosch	none	none	Strom.	Own	Own	d-rd.	Own	Own
Available H-1½	1½	2,550	36x3½	36x5	Own	4-4x5½	Bosch	Opt.	Pierce	Strom.	Detlaff	Cotta	Worm	Wis.	Ross
Available H-2½	2½	3,250	36x4	36x8	Cont.	4-4½x5½	Bosch	Opt.	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timk.	Ross
Available H-3	3½	4,200	36x5	40x5d	Cont.	4-4½x5½	Bosch	Opt.	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timk.	Ross
Available H-5	5	5,575	36x6	40x10	Cont.	4-4½x6	Bosch	Opt.	Cont.	Strom.	B-Lipe	B-Lipe	worm	Savage	Ross
Available H-7	7	6,000	36x6	40x14	Wauk.	4-5x6½	Bosch	Opt.	Wauk.	Strom.	B-Lipe	B-Lipe	worm	Savage	Ross
Beck 1-ton	1	1,650	34x3	34x3	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
Beck A	1½	1,850	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
Beck B	(1½	2,050	34x3½	34x6	Cont.	4-3½x5	Bosch	.....	Pierce	Strom.	Fuller	.....	in-g.	Clark	Lavn.
	(2														
Beck C	(2	2,450	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	.....	.....	.....	.....	worm	Shel.	Lavn.
	(2½														
Beck D	(3	3,700	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	.....	.....	.....	.....	.....	Russel	.....
	(3½														
Bell	1½	.....	32x3½	32x4	Buda	4-3½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	.....	.....	Russel	Gem.
Bell O	2½	.....	34x4	34x6	Buda	4-4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	.....	in-g.	Russel	Gem.
Belmont AA	¾	1,150	31x4	31x4	.....	4-3½x5	Conn.	Dyn.	Pierce	Zenith	G-Lees	G-Lees	in-g.	Clark	Lavn.
Belmont BB	1½	1 950	34x4½	36x5	Cont.	4-3½x5½	Eise.	Dyn.	Pierce	Zenith	G-Lees	G-Lees	in-g.	Clark	Lavn.
Bessemer G	1	1,600	34x3	34x4	Cont.	4-3½x5	Bosch	Opt.	none	Ray.	Fuller	Fuller	in-g.	Torbn.	Ross
Bessemer H-2	1½	2,085	36x3½	36x5	Cont.	4-3½x5	Bosch	Opt.	Pierce	Ray.	B.&B.	B.&B.	in-g.	Torbn.	Ross
Bessemer J-2	2½	2,785	36x4	36x4d	Cont.	4-4½x5½	Bosch	Opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bessemer K-2	4	4,285	36x5	36x10	Cont.	4-4½x5½	Bosch	Opt.	Pierce	Ray.	B.&B.	B-Lipe	in-g.	Torbn.	Ross
Bethlehem K	¾	1,495	34x4½	35x5	Own	4-3½x5	Bosch	G&D	none	Zenith	B.&B.	Det.	bevel	Stan.P	Ross
Bethlehem DG	1½	2,095	34x3½	34x5	Own	4-4x5½	A-K	G&D	Pierce	Strom.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem EH	2½	2,495	34x4	34x6	Own	4-4x5½	A-K	G&D	Pierce	Strom.	B.&B.	Det.	in-g.	Russel	Lavn.
Bethlehem FJ	3½	3,595	34x4	34x5d	Own	4-4½x5½	A-K	G&D	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Bets	2½	2,700	30x4	36x7	Buda	4-4½x5½	Bosch	none	.....	Strom.	.....	Own	in-g.	Own	Gem
Bollstrom A	5	.....	36x6	36x6	Own	4-4½x5½	.....	.....	none	.....	.....	.....	worm	Shel.	Ross
Brinton H	1	1,500	33x4½*	33x4½*	Wis.	4-3½x5	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brinton F	2½	3,400	36x4	36x6	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Duplex Limited A	1½	2,775	35x5	38x7	Hink.	4-4x5½	West.	West.	.....	Strom.	Covert	Covert	worm	Shel.	Ross
Duplex E	3½	4,250	36x8	36x8	Buda	-4½x5½	Eise	Own	none	Strom.	B-Lipe	B-Lipe	in-g.	Own	Wohl.
Duty	2	1,490	34x3½	34x5	Gray	4-3½x5	Simms	.....	.....	Zenith	Covert	Covert	in-g.	Russel	Ditw.
Eagle	2	1,995	34x3½	34x6	Buda	4-3½x5½	Eise.	.....	.....	Zenith	Covert	Covert	worm	Russel	.....
Economy T-LHD	¾	1,250	35x5	35x5	Own	4-3 ½x5½*	A-L	A-L	none	none	Zenith	Warner	in-g	Torbn	Jacox
Elmira C	½	.....	29x3	28x3	Perk.	4-3½x4	A-K	Carl.	none	Holl.*	Own	Own	bevel	Own	Own
Ellsworth 25-A	1½	.....	30x3½	30x3½	Lyc.	4-3½x5	Conn.	.....	none	Car.	Lyc.	G-Lees	bevel	Wis.	Foster
Erie	1½	.....	34x3½	36x5	Buda	4-3½x5	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	2	.....	34x3½	36x5	Buda	4-4½x5½	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	2½	.....	34x4	36x5	Buda	4-4½x5½	Bosch	.....	Pierce	Strom.	.....	.....	worm	Timkn.	.....
Erie	3½	.....	36x5	40x5d	Buda	4-4½x5½	Bosch	.....	.....	.....	.....	.....	.....	.....	.....
Fageol	1½	.....	34x3½	34x6	Wauk.	4-3½x5½	Dixie	opt.	Wauk.	Zenith	B.&B.	Own	worm	Stand.	Ross
Fageol	2½	3,400	34x4	36x7	Wauk.	4-4½x5½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Fageol	3½	4,500	36x5	36x5d	Wauk.	4-4½x6½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Fageol	5	5,300	36x6	40x6d	Wauk.	4-4½x6½	Dixie	opt.	Wauk.	Zenith	B-Lipe	Own	worm	Timkn.	Ross
Famous B-10	1	.....	36x3½	36x4	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Famous B-12	1½	.....	36x3½	36x5	Cont.	4-3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Jacox
Fargo P	2	2,200	36x4	36x6	Cont.	4-3½x5	Bosch	none	Mon.	Ray.	Fuller	Fuller	in-g.	Clark	Ross
Federal SD	1	2,400	35x5*	36x6*	Cont.	4-3½x5	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal TE	1½	2 600	36x3½	36x5	Cont.	4-4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal UE	2	2,900	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal Trac	3	3,050	36x4	36x7	Cont	4-4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal WD	3½	3,850	36x5	36x5d	Cont	4-4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal XC	5	4,550	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Pharo	Zenith	B.&B.	Own	worm	Timkn.	Gem.
Federal Trac	7	4,025	36x5	36x5d	Cont	4-4½x5½	Eise.	opt.	.....	opt.	Own	Own	worm	Own	Own
Ford TT	1	600	30x3½*	32x4½*	Own	4-3½x4	Own	.....	.....	.....	Own	Own	worm	Shel.	Ross
Forschler	1	2,100	36x3	36x4	Cont.	4-3½x5	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	1½	2,375	36x3½	36x5	Cont.	4-3½x5	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	2	2,750	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Forschler	3	3,450	36x4	36x8	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	M.&E.	Cotta	bevel	Own	Ross
F. W. D. B	3	4,500	36x6	36x6	Wis.	4-4½x5½	Simms	.....	.....	Carter	B.&B.	Own	in-g.	Russel	Lavn.
Fulton FX	1½	1,850	34x3½	34x5	H-S	4-3½x5 1/16	Simms	.....	.....	Carter	B.&B.	Covert	in-g.	Russel	Lavn.
Fulton C	2	2,350	34x4	34x6	H-S	4-3½x5	Simms	.....	.....	.....	.....	.....	.....	.....	.....
Gabriel C	1	2,000	35x5	35x5	Buda	4-4½x5½	Bosch	L-N	none	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel E	2	3,250	36x4*	36x7*	Buda	4-4½x5½	Bosch	L-N	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Gabriel F	4	4,300	36x5	40x6d*	Buda	4-4½x6	Bosch	L-N	Duplx.	Ray.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Garford 25	1¼	2,090	36x3½	36x4	Buda	4-3½x5½	Split.	West.	Mon.	Strom.	B-Lipe	Own	worm	Timkn.	Ross
Garford 70-H	2	3,450	36x4	36x7	Buda	4-4½x5½	Split.	West.	Duplx.	Strom.	B-Lipe	Own	worm	Timkn.	Ross
Garford 77-D	3½	4,390	36x5	36x5d	.....	4-4½x6	Split.	.....	Duplx.	Strom.	.....	Own	worm	Timkn.	Ross
Garford 68	5	5,200	36x5	40x6d	Wis.	4-4½x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Garford 69	6	5,000	36x5	40x7d	Wis.	4-5 1/16x5½	Eise.	West.	Duplx.	Ray.	B-Lipe	Own	chain	Own	Ross
Gary F	1	2,100	36x3½	36x4	Buda	4-3½x5	Eise.	.....	McCan.	Master	Fuller	Fuller	worm	Timkn.	Ross
Gary GT	1½	2,550	36x3½	36x5	Buda	4-4x5½	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gary J	2½	3,150	36x4	36x7	Buda	4-4½x5½	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gary KL	3½	4,150	36x5	40x5d	Buda	4-4½x6	Eise.	.....	McCan.	Master	B-Lipe	B-Lipe	worm	Timkn.	Ross
Gary M	5	5,150	36x6	40x6d	Buda	4-5x6½	Eise.	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Gersix M	1½	2,850	36x3½	36x6	Buda	4-4x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Gersix K	2½	3,350	36x4	36x7	Buda	4-4½x5½	Bosch	.....	Mon.	Strom.	B.&B.	Cotta	worm	Own	Ross
Gersix L	3½	4,350	36x5	40x5d	Buda	4-4½x6	Bosch	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Jacx.
Giant 15	1	1,950	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Jacx.
Giant 14	1½	2,375	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Ross
Giant 16	2	2,850	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Giant 17	3½	3,850	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	bevel	.....	Jacx.
G. M. C. 16	½	.....	35x5*	35x5*	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 31	1½	.....	36x3½	36x5	Cont.	4-3½x5	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 41	2	.....	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 71	3½	.....	36x5	40x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Marvel	Own	Own	worm	Timkn.	Jacx.
G. M. C. 101	5	.....	36x6	40x6d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	Fuller	Fuller	in-g.	Torbn.	Lavn
Graham A	1½	2,295	35x5	36x6	Cont.	4-3½x4	Eise.	.....	.....	.....	.....	.....	.....	.....	.....
Gramm-Bernstein 15	1½	.....	36x3½	36x5	Cont.	4-3½x5	N. E.	N. E.	.....	Strom.	Fuller	Fuller	in-g.	Clark	Ross

Abbreviations: Engine—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Dulepx; Cont., Continental; Mon., Monarch; Simplx, Simplex; McCan., McCanna; Rugles, Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespear; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B. Borg & Beck; B-Lipe Brown-Line; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn, Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury· Ind., Industrial; Chcgo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn. Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons apacity	Chassis Price	Front Tires	Rear Tires	Nam of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Briscoe T-34	1	.....	33x4*	34x4	Own	4–3½x5	Conn.	none	Own	Buick	Own	Own	in-g.	Russel	Lavn.
Brockway S-2	1½	2,250	36x3½	36x5	Cont.	4–3½x5	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Shel.	Gem.
Brockway K-4	2½	3,200	36x4	36x7	Cont.	4–4½x5½	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway R-2	3½	4,100	36x5	36x5d	Cont.	4–4½x5½	Eise.	none	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Brockway T	5	5,250	36x6	40x6d	Cont.	4–4½x6	Eise.	.....	Duplx.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Champion	...	1,000	32x4	32x4	Light	4–3½x4½	A-K	.....	none	.....	.....	.....	bevel	.....	.....
Chevrolet T	1	1,325	33x4	35x5*	Own	4–3 11/16x5½	Remy	A-L*	Mon.	Zenith	Own	Warner	worm	.....	Warn.
Clydesdale	1	.....	34x3½	34x5	Cont.	4–3½x5	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	S.P.	Ross
Clydesdale 42	1½	2,445	36x3½	36x6	Cont.	4–3½x5	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 65X	2½	3,200	36x4	36x8	Cont.	4–4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 90	3½	4,075	36x5	40x10	Cont.	4–4½x5½	Bosch	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Clydesdale 120B	5	5,025	36x6	40x12	Cont.	4–4½x6	Bosch	.....	Own	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Collier 18	1	.....	34x4	34x5	Cont.	4–3½x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chego.	Ross
Collier 19	1½	.....	36x6	36x6	Cont	4–3½x5	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chego.	Ross
Collier 20	2	.....	36x4	36x7	Cont.	4–4½x5½	Eise.	.....	Mon.	Zenith	Fuller	Fuller	worm	Chego.	Ross
Columbia F	1	1,750	34x3½	34x4	Cont.	4–3½x5	Dixie	.....	Pierce	Shake.	B.&B.	Covert	in-g.	Russel	Own
Columbia H	1½	2,200	34x3½	34x5	Hink.	4–3½x5½	Bosch	.....	Hink.	Strom.	Det.	Covert	in-g.	Russel	.....
Columbia G	2½	2,750	36x4	36x7	Hink.	4–4 x5½	Bosch	Remy	Hink.	Strom.	Det.	Covert	in-g.	Russel	Own
Comet	1½	1,950	34x4	34x4	Lyc.	4–3½x5	Delco.	Dneto.	.....	Carter	B.&B.	Muncie	worm	Chego.	C.A.S
Commerce E	1	1,855	34x3	34x4	Cont.	4–3½x5	Eise.	Bijur*	none	Zenith *	Det.	Det.	in-g.	Torbn.	Jacox
Commerce EP	2	2,225	36x6	36x6	Cont.	4–3½x5	Eise.	Bijur*	none	Zenith *	Det.	Det.	in-g.	Torbn.	Jacox
Concord A	1½	2,350	36x3½	36x5	Buda	4–3½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Concord B	2½	2,850	36x4	36x4d	Buda	4–4½x5½	Eise	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Conestoga 12	½	.....	32x4½	32x4½	Cont.	4–3½x5	Simms	.....	.....	Strom.	B.&B.	Muncie	in-g.	Torbn.	C.A.S.
Conestoga 20	1	2,100	34x3½	34x5	Cont.	4–3½x5	Simms	.....	.....	Strom.	Fuller	Fuller	worm	Wis.	Ross
Conestoga 30	2	2,700	36x4	36x4d	Cont.	4–3½x5	Simms	.....	Dplx.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Corbitt E	1	2,400	34x3½	34x4	Cont.	4–3½x5	Eise.	Disco*	Simplx.	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt D	1½	2,800	36x3½	36x5	Cont.	4–3½x5	Eise.	Disco*	Simplx	Strom.	Fuller	Fuller	worm	Shel.	Ross
Corbitt C	2	3,500	..x4	36x7	Cont.	4–4½x5½	Eise.	none	Simplx	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt B	2½	3,650	36x4	36x7	Cont.	4–4½x5½	Eise.	none	Simplx	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt A	3½	4,500	36x5	36x5d	Cont.	4–4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Corbitt AA	5	5,500	36x6	40x6d	Cont.	4–4½x6	Eise.	none	Pierce	Strom.	Detlaff	B-Lipe	worm	Shel.	Ross
Dart H	1	2,100	34x3½	34x5	Buda	4–3½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart S	1½	2,250	34x3½	34x6	Buda	4–3½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart M	2½	3,000	36x4	36x7	Buda	4–4½x5½	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Dart W	3½	4,000	36x5	36x10	Buda	4–4½x6	Eise.	Bijur*	Pierce	Zenith	Fuller	Fuller	worm	Own	Ross
Day-Elder A	1	1,995	34x3	34x4	Cont.	4–3½x5	Eise.	.....	.....	Zenith	Covert	Covert	worm	Shel.	Gem.
Day-Elder B	1½	2,300	34x3½	34x5	Cont.	4–3½x5	Eise.	.....	.....	Zenith	Covert	Covert	worm	Shel.	Gem.
Day-Elder D	2	2,750	36x4	36x7	Cont.	4–4½x5½	Eise.	.....	Mon.	Zenith	Covert	Covert	worm	Shel.	Gem.
Day-Elder C	2½	2,950	36x4	36x7	Buda	4–4½x5½	Eise.	.....	Mon.	Zenith	Covert	Covert	worm	Shel.	Gem.
Day-Elder F	3½	3,700	36x5	36x5d	Cont.	4–4½x5½	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Day-Elder E	5	4,600	36x5	40x6d	Buda	4–4½x6	Eise.	.....	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Dearborn, F	1½	1,980	34x4*	34x5	Cont.	4–3½x5	Bosch	.....	.....	Strom.	Fuller	Fuller	worm	Stand.	Lavn.
Dearborn, 48	2	2,390	34x4½	34x7	Buda	4–3½x5½	Bosch	.....	.....	Strom.	Fuller	Fuller	worm	Stand.	Det.
Defiance, D	1½	2,450	35x5	36x6	Cont.	4–3½x5	Eise.	.....	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Own
Defiance, E	2	2,650	35x5	38x7	Cont.	4–3½x5	Eise.	.....	none	Strom.	B.&B.	G-Lees	in-g.	Torbn.	Own
DeKalb, E-2	2	2,100	34x3½	36x5	Cont.	4–4½x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	Ross
DeKalb, E-2½	2½	2,600	36x4	36x6	Cont.	4–4½x5½	Eise.	none	none	Master	Fuller	Fuller	worm	Timkn.	Ross
Denby, 12	1	1,950	35x5	36x6	Cont.	4–3½x5	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Ross
Denby, 134	2	2,450	36x3½	36x6	Cont.	4–3½x5	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Denby, 25	3	3,250	36x4	36x7	Cont.	4–4½x5½	Eise.	none	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Denby, 27	4	4,150	36x5	36x10	Cont.	4–4½x5½	Eise.	.....	Simplx.	Strom.	Own	Warner	in-g.	Clark	Ross
Denby, 210	5	4,900	36x6	40x12	Cont.	4–4½x5½	Eise.	Simp.	none	Simp.	Strom.	Warner	in-g.	Clark	Ross
Dependable	1½	2,150	34x3½	34x5	Buda	4–3½x5½	Dixie	.....	Pierce	Strom.	Fuller	Fuller	worm	Wis.	Ross
Dependable	2½	2,750	36x4	36x7	Buda	4–4½x5½	Dixie	.....	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
Diamond-T, FS	1½	3,100	36x3½	36x5	Own	4–3½x5½	Bosch	.....	.....	Strom.	Covert	Covert	worm	Wis.	Gem.
Diamond, T, U	2	3,485	36x4	36x7	Own	4–4 x5½	Bosch	.....	.....	Strom.	Covert	Covert	worm	Timkn.	Gem.
Diamond, T, K	3½	4,825	36x5	36x5d	Own	4–4½x5½	Bosch	.....	Pierce	Strom.	Covert	Covert	worm	Timk n.	Gem.
Diamond-T, S	5	5,900	36x6	40x6d	.....	4–4½x6	Bosch	.....	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Diehl, A	1	1,575	34x4½	35x5	Cont.	4–3½x5	Bosch	Presto	none	Zenith	B.&B.	Durstn	in-g.	Torbn.	Jacox.
Doane	2	3,750	36x5	36x7	Wauk.	4–4½x5½	Bosch	.....	.....	Master	B-Lipe	B-Lipe	Chain	Own	Own
Doane	6	5,825	36x6	40x6d	Wauk.	4–4½x6½	Bosch	none	Wauk.	Master	B-Lipe	.....	Chain	Own	Lavn.
Dodge	¾	.....	32x3½	32x3½	Own	4–3½x4½	Own	N.E.	none	Stew.	Own	Own	.....	Own	Own
Dorris, K4	2	3,285	36x4	36x7	Own	4–4½x5½	Bosch	West.*	Own	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Ross
Dorris, K7	3	4,200	36x5	36x10	Own	4–4½x5½	Bosch	West.*	Own	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Ross
Douglas G	1½	2,200	35x5	36x6	Weid	4–3½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	in-g.	Torbn.	Ross
Douglas H	2	2,800	34x4	36x7	Buda	4–4½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	in-g.	Torbn.	Ross
Douglas I	3	3,500	36x6	40x8	Buda	4–4½x5½	Eise.	none	Pierce	Scheb.	Fuller	.....	worm	Wis.	Ross

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl., Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Gramm-Bernstein 65	1½	.....	36x3½	36x5	Cont.	4–3½x5	N. E.	N. E.	.....	Strom.	Fuller	Own	worm	Stan-P	Ross
Gramm-Bernstein 20	2	.....	36x4	36x7	Cont.	4–4½x5½	N. E.	N. E.	.....	Strom.	Fuller	Own	worm	Shel.	Ross
Gramm-Bernstein 25	2½	.....	36x4	36x4d	Hink.	4–4½x5½	Eise.	N. E.	.....	Strom.	Own	Own	worm	Stan-P	Ross
Gramm-Bernstein 35	3½	.....	36x5	40x5d	Hink.	4–4½x5½	Eise.	N. E.	.....	Strom.	Own	Own	worm	Stan-P	Ross
Gramm-Bernstein 50	5	.....	36x6	40x6d	Cont.	4–4½x6	Eise.	N. E.	Hink.	Strom.	Own	Own	worm	Stan-P	Ross
Grant 17	1½	2 675	35x5	38x7	Cont.	4–3½x5	Split.	Remy	Pierce	Car.*	B-Lipe	B-Lipe	in-g.	Torbn.	Jacx.
Hahn J-4	1	.....	36x3½	36x5	Cont.	4–3½x5	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Shel.	Ross
Hahn CD	1½	.....	36x3½	36x6	Cont.	4–4½x5½	Opt.	.....	Pierce	Opt	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn DE	2	.....	36x4	36x7	Cont.	4–4½x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn EE	2½	.....	36x4	36x8	Cont.	4–4½x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn F	3½	.....	36x5	36x10	Cont	4–4½x5½	Opt.	.....	Pierce	Opt.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hahn FE	5	.....	36x6	40x12	Cont.	4–4½x6	Opt.	.....	Pierce	Opt	B-Lipe	B-Lipe	worm	Timkn.	Ross
Hal-Fur D	1	2,000	35x5	35x5	Hink.	4–4x5½	Bosch	West.	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Hal-Fur B	2½	2,750	35x5	36x7	Hink.	4–4½x5½	Bosch	none	Duplx.	Strom.	B.&B.	B-Lipe	worm	Timkn.	Gem.
Hall	2	2,875	36x4	36x4d	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem
Hall	3½	3,750	36x5	36x5d	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	5	4,850	36x5	40x6d	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Hall	7	4,850	36x5	40x6d	Cont.	4–4½x5½	Bosch	.....	Duplx.	Zenith	B-Lipe	B-Lipe	chain	Timkn.	Gem.
Harvey WEA	1½	2,550	34x3½	34x5	Buda	4–4½x5½	Bosch	.....	Mon.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Harvey WFA	2½	3,300	36x4	36x7	Buda	4–4½x5½	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WHA	3½	4,300	36x5	36x5d	Buda	4–4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Harvey WKA	5	5,200	36x6	40x6d	Buda	4–4½x6	Eise.	.....	Duplx.	Strom.	B.&B.	B-Lipe	worm	Shel.	Ross
Hawkeye K	1½	1,995	34x3½	34x5	Buda	4–3½x5½	Eise.	.....	Simplx	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Hawkeye M	2	2,650	36x4	36x6	Buda	4–4½x5½	Eise.	West.	Simplx	Zenith	Fuller	Fuller	in-g.	Clark	Ross
Hendrickson	2½	3,200	36x4	36x7	Buda	4–4½x5½	.....	.....	.....	Strom.	Fuller	.....	worm	Timkn.	Ross
Hendrickson	3½	4,000	36x5	36x5d	Buda	4–4½x5½	.....	.....	.....	Strom.	Fuller	.....	worm	Timkn.	Ross
Hendrickson	5	5,250	36x6	40x6d	.....	4–5x6	.....	.....	.....	Strom.	.....	.....	worm	Timkn.	Ross
Highway Kn't A	4	5,000	36x5	36x6	Knight	4–4x6	Eise.	Wag.	Mon.	Zenith	.....	.....	worm	Shel.	Ross
Highway Kn't	5	5,800	36x5	40x6d	Knight	4–4x6	Eise.	Wag.	Mon.	Zenith	.....	.....	worm	Shel.	Ross
Huffman C	1½	1,695	34x3½	34x6	Buda	4–3½x5	Dixie	.....	.....	Zenith	Fuller	Fuller	worm	Torbn.	Lavn.
Huffman B	1½	1,895	34x3½	34x6	Cont.	4–3½x5	Dixie	.....	.....	Zenith	Fuller	Fuller	worm	Chgo.	Lavn.
Hurlburt A	1½	2,850	34x4	34x5	Buda	4–4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt B	2½	3,750	36x4	36x4d	Buda	4–4½x5½	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt C	3½	4,400	36x5	36x5d	Buda	4–4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Hurlburt D	5½	5,250	36x5	40x6	Buda	4–4½x6	Eise.	Vesta	Duplx.	Flech.	B-Lipe	B-Lipe	worm	Own	Ross
Independent F	1–2	.....	36x3½	36x5	Cont.	4–3½x5	Eise.	.....	Pierce	Scheb.	Fuller	Fuller	worm	Wis.	Ross
Indiana 12	1½	.....	34x3½	34x5	Wauk	4–3½x5½	Eise.	West.	Wauk.	Strom.	B.&B.	Covert	worm	Shel.	Wol.
Indiana 20	2	.....	36x4	36x7	Ruten.	4–4½x5½	Eise.	West.	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana 25	2½	.....	36x4	36x8	.....	4–4½x5½	.....	.....	.....	.....	.....	.....	worm	.....	.....
Indiana 35	3½	.....	36x5	36x5d	Ruten.	4–4½x5½	Eise.	West	Pierce	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
Indiana 50	5	.....	36x5	40x6d	Wauk.	4–4½x6½	Eise.	West.	Wauk.	Strom.	B.&B.	B-Lipe	worm	Shel.	Wol.
International H	¾	1,750	36x3½	36x3½	Own	4–3½x5½	Bosch	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Own
International F	1	1,950	36x3½	36x4	Own	4–3½x5½	Bosch	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Own
International K	1½	2,300	36x3½	36x5	Own	4–3½x5½	Bosch	N. E.*	Own	Ens.	Own	Own	in-g.	Own	Own
International G	2	2,700	36x4	36x6	Own	4–4½x5	Split.	N. E.*	Own	Ens.*	Own	Own	in-g.	Own	Own
International L	3½	4,500	36x5	40x10	Own	4–4½x5	Split.	N. E.*	Own	Ens.*	Own	B-Lipe	in-g.	Own	Own
Jackson C	3½	4,250	36x7	36x7	Cont.	4–4½x5½	Eise.	Eise.	Pierce	Strom.	B.&B.	Own	bevel	Own	Ross
Jumbo 15	1½	2,850	36x3½	36x5	Buda	4–3½x5½	N. E.	N. E.	none	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 20	2	3,100	35x5	38x7	Buda	4–3½x5½	Eise.	N. E.	none	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 25	2½	3,450	36x4	36x7	Buda	4–4½x5½	Eise.	Eise.	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 30	3	3,950	36x6	42x9	Buda	4–4½x5½	Eise.	Eise.	Duplx.	Zenith	Fuller	Fuller	in-g.	Clark	Jacx.
Jumbo 35	3½	4,550	36x5	36x10	Buda	4–4½x6	Eise.	Eise.	Simplx.	Zenith	B-Lipe	B-Lipe	in-g.	Clark	Jacx.
Jumbo 40	4	5,200	38x7	44x10	Buda	4–4½x6	Eise.	Eise.	Simplx.	Zenith	B-Lipe	B-Lipe	in-g.	Clark	Jacx.
Kalamazoo G	1½	.....	34x4	34x5	Cont.	4–3½x5	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Wis.	Ross
Kalamazoo H	2½	.....	34x5	36x7	Wis.	4–4x6	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Kalamazoo K	3½	.....	36x5	36x5d	Wis.	4–4½x6	Bosch	Dneto.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Ross
Kankakee E	2½	2,875	34x4	36x6	Cont.	6–3½x5½	Delco	Delco	.....	Zenith	Warner	Warner	in-g.	Russel	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc.,Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swarts; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx, Simplex; McCan., McCanna; Rugles, Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn, Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury Ind., Industrial; Chogo., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Guide to Truck Specifications—Continued

These tables are revised and brought up to date monthly

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Kearns	¾	1,550	32x4½	32x4½	Light	4-3½x4½	Berl.	Dyn.	Mon.	Zenith	B.&B.	G-L	in-g.	Torbn.	Lavn.
Kearns	1½	2,100	34x3½	34x6	H-S	4-3½x5	Berl.	none	Pierce	Zenith	B.&B.	G-L	in-g.	Torbn.	Lavn.
Keldon, 19	2	2,885	36x4	36x7	Buda	4-4½x5½	Eise.	none	Pierce	Strom.	Fuller	Fuller	in-g.	Russel	Ross
Kelly-S, K-31	1½	3,000	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-32	1½	3,000	36x3½	36x6	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	worm	Own	Gem.
Kelly-S., K-35	2½	3,500	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	Chain	Own	Gem.
Kelly-S., K-36	2½	3,500	36x4	36x4d	Own	4-3½x5½	Eise.	opt.*	Pierce	Zenith	Own	Covert	worm	Own	Gem.
Kelly-S., K-40	3½	4,400	36x4	40x5d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Kelly-S., K-45	4	4,500	36x5	40x6d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Kelly-S., K-50	5	5,150	36x6	40x6d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Kelly-S., K-60	6	6,500	36x6	40x7d	Own	4-4½x6½	Eise.	opt.*	Pierce	Ray.	Own	Covert	Chain	Own	Gem.
Keystone	1	1,375	31x4*	33x5*	Own	4-3½x4	A-L	.....	.....	Tillot.	Own	Own	in-g.	Torbn.	Own
Keystone	2	2,100	35x5*	38x7*	Buda	4-3½x5½	Berl.	none	Pierce	Zenith	Fuller	Fuller	in-g.	Russel	Ross
Kimball, B	2	3,675	36x4	36x7	Wis.	4-4 x6	Eise.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, C	2½	3,975	36x4	36x7	Wis.	4-4½x6	Eise.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, K	3	4,400	36x4	36x8	Wis.	4-4½x5½	Berl.	.....	Duplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Kimball, E	4	5,000	36x5	40x10	Wis.	4-5x5½	Berl.	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Kimball, F	5	5,975	36x6	40x12	Wis.	4-5½x6	Berl.	.....	Duplx.	Zenith	Fuller	Fuller	worm	Shel.	Ross
Kissel	¾	2,175	34x4½ *	34x4½	Own	4-3½x5½	Eise.	.....	Pierce	Strom.	W.G.Co	W.G.Co	.....	Own	Jacx.
Kissel	1½	2,975	36x3½	36x5	Own	4-3½x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Jacx.
Kissel, Gen Utility	2	2,775	36x4	36x7	Own	4-4½x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Timkn.	Lavn.
Kissel	3½	4 475	36x5	36x5d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Ross
Kissel, Freighter	5	5,085	36x6	36x6d	Own	4-4½x5½	Eise.	*	Pierce	Strom.	W.G.Co	W.G.Co	worm	Shel.	Ross
Kimball, A	1½	3,075	36x3½	36x5	Wis.	4-4x5	Bosch	.....	Duplx.	Zenith	.....	B-Lipe	worm	Shel.	Lavn.
Kleiber, AA	1	.....	34x3½	34x5	Cont.	4-3½x5½	Bosch	.....	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Kleiber, A	1½	.....	36x3½	36x6	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, BB	2	.....	36x4	36x3½d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Kleiber, B	2½	.....	36x5	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Shel.	Ross
Kleiber, C	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	H-Shaw	B-Lipe	worm	Timkn.	Ross
Knox, 35-Tractor	5	6,000	36x4	38x6d	Own	4-5 x5½	Berl.	G.&D.	None	Zenith	Own	Own	Chain	Own	Ross
Knox, 36-Tractor	10	6,500	36x4	38x6d	Own	4-5 x5½	Berl.	G.&D.	None	Zenith	Own	Own	Chain	Own	Ross
Koehler, C	1½	1,985	34x3	34x5	H-S	4-3½x5	Eise.	none	Simplx	Zenith	Mech.	Mech.	in-g.	Torbn.	Own
Koehler, M	2½	3,365	36x4	36x7	Herc.	4-4 x5½	Eise.	none	Simplx	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Koehler Trac.,MT	5	3,450	36x4	36x7	Herc.	4-4 x5½	Eise.	none	Simplx	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Larrabee, U	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Bosch	.....	Simplx	Scheb.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, EK&SK	2½	3,250	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Simplx	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee, EL &SL	3½	4,000	36x5	36x5d	Cont.	4-4½x5½	Bosch	.....	Simplx	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Larrabee,SW&EW	5	4,900	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Simplx	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Leudinghaus,KLS	2	2,790	36x4	36x7	Wauk.	4-4½x5½	Split.	.....	Wauk.	Scheb.	B.&B	Detroit	worm	Wis.	Lavn.
L. M. C.	2½	2,950	36x4	36x4d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B.&B.	.....	in-g.	Russel	.....
Lombard	7	.....	.....	.....	.....	6-5½x7	Simms	.....	Own	Scheb.	.....	.....	worm	.....	.....
Maccar, S	1	2,400	34x3½	34x4	Cont.	4-3½x5	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, L	1½	2,925	36x4	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, H	2½	3,500	36x4d	36x4	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, M	3½	4,300	36x5	36x5d	Wis.	4-4½x6	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Maccar, G	5½	5,250	36x5	40x6d	Wis.	4-5 x6	Eise.	.....	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Mack, AB	1½	3,000	36x4	36x3½d	Own	4-4 x5	Dixie	none	Pierce	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack, AB	1½	3,000	36x4	36x3½d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack, AB	2	3,300	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack, AB	2	3,300	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Mack Trac., AB	5	3,400	36x4	36x4d	Own	4-4 x5	Dixie	.....	Own	Zenith	B-Lipe	B-Lipe	Chain	Own	Gem.
Mack , AC	3½	4,950	36x5	40x5d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack, AC	5	5,500	36x5	40x6d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack, AC	6½	5,750	36x6	40x6d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack Trac., AC	7	4,950	36x5	40x7d	Own	4-5 x6	Dixie	.....	Own	Zenith	Own	Own	Chain	Own	Gem.
Mack AC	7½	6,000	36x7	40x7d	Own	4-5x6	Dixie	.....	Own	Zenith	Own	Own	chain	Own	Gem.
Mack Trac. AC	10	5,500	36x6	40x6d	Own	4-5x6	Dixie	.....	Own	Zenith	Own	Own	chain	Own	Gem.
Mack Trac. AC	13	5,750	36x6	40x12s	Own	4-5x6	Aero	.....	Own	Zenith	Own	Own	chain	Own	Gem.
Mack Trac. AC	15	6,000	36x7	40x7d	Own	4-5x6	Dixie	.....	Own	Zenith	Own	Own	chain	Own	Gem.
Master JI	1½	2,390	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	Fuller	Fuller	in-g.	Timkn.	Ross
Master JW	1½	2,490	34x3½	34x5	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	Fuller	Fuller	worm	Timkn.	Ross
Master WL	2	3,190	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master M	2½	2,790	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Timkn	Ross
Master O	2½	2,899	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Timkn	Ross
Paige, 51-18	3½	4,150	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Simplx	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Parker, F20	2	3,500	34x4	36x4d	Wis.	4-4x6	Bosch	West.	Mon.	Strom.	B-Lipe	Fuller	worm	Own	Ross
Parker, J20	3½	4,400	36x5	40x5d	Wis.	4-4½x6	Bosch	West	Mon.	Strom.	B-Lipe	Warner	worm	Own	Ross
Parker, M20	5	5,500	36x6	40x6d	Wis.	4-4½x6	Bosch	West.	Simplx.	Strom.	B-Lipe	Warner	worm	Own	Ross
Patriot, Revere	¾	1,890	35x5*	35x5*	Cont.	4-3½x5	A-K	Bijur	.....	Strom.	B. & B.	Covert	worm	Empire	.....
Patriot, Lincoln	1½	2,650	34x3½	34x3½d	Hink.	4-4x5½	Split	.....	Hink.	Strom.	Covert	Fuller	worm	Empire	Ross
Patriot, Wash	2½	3,650	36x4	36x3½d	Hink.	4-4½x5½	.....	.....	Hink.	Strom.	Covert	Covert	worm	Empire	Ross
Pierce-Arrow,X4	2	4,300	36x4	36x4d	Own	4-4x5½	Dixie	Vesta	Own	Own	Own	Own	worm	Own	Own
Pierce-Arrow,R9	5	5,500	36x5	40x6d	Own	4-4½x6	Dixie	Vesta	Own	Own	Own	Own	worm	Own	Own
Pioneer All Steel,F	2	2,790	36x4	36x7	Cont.	4-4½x5½	Eise.	None	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Pony	¼	320	28x3	28x3	Own	4-2½x4	A-K	opt.	opt.	Strom.	.....	.....	chain	Own	Own
Power, B	2	2,950	36x4	36x4d	Cont.	4-4½x5½	Simms	None	Pierce	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Ranger	.....	.....	.....	34x3½	34x5	Cont.	4-3½x5	Dixie	.....	.....	Zenith	.....	.....	Timkn	.....
Ranier, R-11	¾	1,850	34x4½	34x4½	Cont.	4-3½x5½	Simms	opt.	Mon.	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Ranier, R-9	1	2,050	32x3	32x4	Cont.	4-3½x5	Simms	opt.	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Ranier, R-6	1½	2,150	34x3	34x3	Cont.	4-3½x5½	Simms	opt.	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Lavn.
Ranier, R-8	2	2,650	34x4	34x6	Cont.	4-3½x5½	Simms	opt.	Mon.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Reliance, A-10	1½	2,500	36x3½	36x5	Buda	4-4x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	ext-g	Badger	Ross
Reliance, B-20	2½	3,200	36x4	36x4d	Buda	4-4½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Cotta	ext-g	Badger	Ross
Reo, F	1¼	1,385	34x4½	34x4½	Own	4-4½x4½	Remy	Remy	none	John.	Own	Own	bevel	Own	Own
Republic, 10	1	.....	34x3	34x3	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g	Torbn.	Jacx.
Republic, 11X	1½	2,050	34x3½	34x5	Cont.	4-3½x5	Eise.	none	Rugles	Strom.	Fuller	Fuller	in-g	Torbn.	Jacx.
Republic, 19	2½	2,595	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Pharo	Strom.	Fuller	Fuller	in-g	Torbn.	Jacx.
Republic, 20	3½	3,795	36x5	36x10	Cont.	4-4½x5½	Eise.	none	Pharo	Strom.	Fuller	Fuller	in-g	Torbn.	Jacx.
Reynolds	1½	2,650	36x3½	36x6	Own	4-4x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	2½	3,350	36x4	36x8	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	3½	4,350	36x5	36x5	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Reynolds	5	5,350	36x6	36x6d	Own	4-4½x5½	Eise.	.....	Hink.	Strom.	Own	Own	worm	Own	Own
Riker, B	3	4,600	36x5	36x5d	Own	4-4½x6	Berl.	West.	Own	B. & B.	Own	Own	worm	Own	Ross
Riker, BB	4	4,700	36x5	36x6	Own	4-4½x6	Berl.	West.	Own	B. & B.	Own	Own	worm	Own	Ross
Rowe, CDW	2	3,300	34x4	36x3½	Wis	4-4x5	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CDW	2½	3,575	34x4	36x4d	Wis.	4-4x5	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, CW	1½	2,800	36x6*	36x6*	Wis.	4-3½x5	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GSW	3	3,900	36x5	36x5d	Wis.	4x5	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, GPW	3	4,950	38x7	42x9	H-S	3½x5	A-K	West.	.....	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, HW	4	4,350	36x5	36x6d	Wis.	4½x6	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Rowe, FW	5	5,390	36x6	40x6d	Wis.	4½x6	Bosch	.....	Simplx.	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Sandow, G	1	2,095	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, CG	1½	2,390	34x3	34x5	Cont.	4-3½x5	Eise.	.....	.....	Strom.*	Fuller	Fuller	worm	Shel.	Ross
Sandow, J	2½	3,175	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, L	2	2,575	36x4	36x6	Cont.	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g	Torbn.	Ross
Sandow, K	3½	4,195	36x5	36x5d	Cont.	4-4½x5	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sandow, M	5	4,975	36x6	40x6d	Cont.	4-4½x5½	Bosch	.....	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, W-25	2½	3,290	36x4	36x4d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sanford, W-35	3½	4,050	36x5	36x5d	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B. & B.	B-Lipe	worm	Shel.	Ross
Sanford, W-50	5	4,950	36x5	40x6d	Cont.	4-4½x5½	Bosch	.....	Pierce	Strom.	B. & B.	B-Lipe	worm	Shel.	Ross
Schacht	2	.....	36x4	36x7	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Hart.	Own	worm	Own	Own
Schacht	2½	.....	36x4	36x4d	Buda	4-4½x5½	Bosch	none	Duplx.	Scheb.	Own	Own	worm	Own	Own
Schacht	3½	.....	36x5	36x5d	Buda	4-4½x6	Bosch	none	Duplx.	Scheb.	Own	Own	worm	Own	Own
Schacht	5	.....	36x5	40x6d	Buda	4-4½x6	Bosch	none	Duplx.	Scheb.	Own	Own	worm	Own	Own
Schwartz, B	1½	2,175	34x3½	34x5	Cont.	4-3½x5	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	in-g	Torbn.	Ross
Schwartz, C	2½	2,675	36x4	36x7	Cont.	4-4½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	in-g	Torbn.	Ross
Schwartz, D	5	4,500	36x6	36x6d	Buda	4-4½x6	Bosch	Bijur	Duplx.	Strom.	B-Lipe	B-Lipe	in-g	Torbn.	Ross
Selden	1½	2,460	34x3½	35x5	Cont.	4-3½x5	Bosch	N. E.	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn
Selden	2½	3,550	36x4	36x7	Cont.	4-4½x5½	Eise.	N. E.	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Selden	3½	4,325	36x5	36x10	Cont.	4-4½x5½	Eise.	N. E.	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Selden	5	5,770	36x6	40x12	Cont.	4-4½x6	Eise.	Conn.	Cont.	Strom.	Det.	B-Lipe	worm	Timkn.	Gem.
Seneca, L	½	.....	30x3½3	0x3½	LeR.	4-3½x4½	Conn.	A-Ch.	.....	Scheb.	B. & B.	Warren	bevel	Peru	Ditw.
Service, LLO	1	2,460	34x3½	34x5	Buda	4-3½x5½	Eise.	West.*	none	Strom.	Fuller	Fuller	worm	Timkn.	Ross
Service, 31	1½	2,985	36x3½	36x6	Buda	4-4x5½	Eise.	West.*	Duplx.	Strom.*	B. & B.	B-Lipe	worm	Timkn.	Ross
Service, 36	1½	3,415	35x5*	38x7*	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B. & B.	B-Lipe	worm	Timkn.	Ross
Service, 51	2½	3,475	36x4	36x7	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B. & B.	B-Lipe	worm	Timkn.	Ross
Service, 71	3½	4,285	36x5	36x5d	Buda	4-4½x5½	Eise.	West.*	Duplx.	Strom.	B. & B.	B-Lipe	worm	Timkn.	Ross
Service, 76	3½	4,485	36x5	36x5 d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B. & B.	B-Lipe	worm	Timkn.	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx, Simplex; McCan., McCanna; Rugles, Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury, Ind., Industrial; Chcgo., Chicago Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
Master W	2½	3,000	34x4	36x7	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master A	3½	4,190	36x5	40x5d	Buda	4-4½x6	Eise.	opt.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master B	5	5,290	36x6	40x6d	Buda	4-4½x6½	Eise.	opt.	Pierce	Mast.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Master Trac. T	6	3,050	34x4	36x4d	Buda	4-4½x5½	Eise.	opt.	McCan.	Mast.	B-Lipe	B-Lipe	in-g.	Torbn.	Ross
Maxwell	1½	1,322	32x3	32x4	Own	4-3⅛x4½	A-K	A-L	Own	Spec.	Own	Own	worm	Own	Own
Menominee															
Hurrytown	1	2,080	34x3½	36x5	Wis.	4-3½x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Menominee H	1½	2,725	36x3½	36x5	Wis.	4-4x5	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Menominee D	2	3,245	36x4	36x4d	Wis.	4-4x6	Eise.	.....	Mon.	Strom.	Fuller	Fuller	worm	Wis.	Ross
Menominee G	3½	4,270	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Mon.	Strom.	B. & B.	Cotta	worm	Timkn.	Ross
Menominee J	5	5,450	36x6	40x6d	Wis.	4-4½x5½	Eise.	.....	.....	Strom.	B. & B.	Cotta	worm	Timkn.	Ross
Moreland 19-B	1½	2,930	36x3½	36x5	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland 19-C	2½	3,775	36x4	36x7	Cont.	4-4½x5½	Dixie	.....	.....	Miller	Own	Own	worm	Timkn.	Ross
Moreland 19-G	4	4,875	36x5	40x5d	Cont.	4-4½x6	Dixie	.....	Cont.	Miller	Own	Own	worm	Timkn.	Ross
Moreland 19-J	5	5,350	36x6	40x6d	Cont.	4-4½x6	Dixie	.....	Cont.	Miller	Own	Own	worm	Timkn.	Ross
Muskegon 20	2	2,325	36x4	36x6	Cont.	4-4½x5½	Eise.	.....	Pierce	Detroit	Fuller	Fuller	in-g.	Torbn.	Lavn.
Mutual	2	3,450	36x4	36x8	Wis.	4-4½x6	Bosch	West.	Duplx.	Strom.	H-Shaw	Fuller	worm	Wis.	Ross
Mutual	3½	.....	36x5	.....	Wis.	4-4½x5½	Bosch	West.	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Mutual	5	.....	36x6	.....	Wis.	4-5.1x5½	Bosch	West.	Duplx.	Strom.	H-Shaw	Warner	worm	Wis.	Ross
Napoleon 9	1	1,535	32x3½	32x4	Gray	4-3½x5	Conn.	A-L	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn.
Napoleon 11	1½	1,860	34x4	34x5	Gray	4-3½x5	Conn.	A-L	.....	Strom.	Fuller	Fuller	in-g	Clark	Lavn.
Nash 2018	1	1,785	34x4	34x3	Own	4-3½x5½	Eise.	A-L	Simplx.	Strom.	B. & B.	Detroit	in-g	Clark	Lavn.
Nash 3018	2	2,395	34x4	36x6	Own	4-3½x5½	Eise.	A-L	Simplx.	Strom.	B. & B.	Detroit	in-g	Clark	Jacx.
Nash 4017	2	3,250	34x5	36x5	Buda	4-4½x5½	Eise.	none	Simplx.	Strom.	B. & B.	Own	in-g	Own	Lavn.
Nelson & LeM., F	1	2,250	36x3½	36x4	Cont.	4-4½x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nelson & LeM., F2	2	.....	36x4	36x7	Cont.	4-4½x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Nels'n & LeM., F3½	3½	.....	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
N'ls'n & LeM., FC5	5	.....	36x6	40x6d	Cont.	4-4½x6	Bosch	West.*	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Lavn.
Netco, D	2	3,100	36x4	36x6	Cont.	4-4½x5½	Eise.	none	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Netco, H	2½	3,500	36x4	36x7	Cont.	4-4½x5½	Eise.	none	none	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Niles	1–2	.....	36x4	36x7	Cont.	4–	Eise.	.....	Pierce	Strom.	B. & B.	Covert	.....	Timkn.	Gem.
Noble, A-20	1	.....	36x3½	36x4	Buda	4-3½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, B-30	1½	.....	36x3½	36x5	Buda	4-3½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, C-40	2	.....	36x4	36x7	Buda	4-4x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, D-50	2½	.....	36x4	36x8	Buda	4-4½x5½	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Noble, E-70	3½	.....	36x5	36x10	Buda	4-4½x6	Eise.	Eise.	Pierce	Strom.	Fuller	Fuller	worm	Shel.	Lavn.
Northway, B-2	2	3,300	36x4	36x4d	Own	4-4x6	Wag.	West.	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Northway, B-3½	3½	4,300	36x5	40x5d	Own	4-4x6	Wag.	West	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Norwalk, 2000	1	1,695	34x4*	34x4*	Lyc.	4-3½x5	Delco	Dneto.*	none	Zenith	B. & B.	G-Lees	worm	Stand.	C.A.S.
Norwalk, 3000	1½	2,025	34x4	34x5	Lyc.	4-3½x5	Delco	Dneto.*	none	Zenith	B. & B.	G-Lees	worm	Stand.	C.A.S.
O.K	1½	2,450	36x3½	36x5	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
O.K	2½	3,250	36x4	36x7	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
O.K	3½	4,150	36x5	36x5d	Buda	4-4½x6	Eise.	none	Pierce	Zenith	Fuller	Fuller	worm	Wis.	Ross
Old Hickory, W	1	2,175	36x3½	36x4	Cont.	4-3½x5	Eise.	.....	Pierce	Strom.	B. & B.	G-Lees	worm	Timkn.	Lavn.
Oldsmobile	¾	1,250	35x5*	35x5*	Own	4-3⅛x5½	A-L	A-L	.....	Zenith	Own	Warner	in-g.	Torbn.	Jacx.
Old Reliable, A	1½	2,350	34x3½	36x6	Wis.	4-4x5	Bosch	opt.	Mon.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Ross
Old Reliable, B	2½	3,500	36x4	36x4d	Wis.	4-4½x6	Bosch	opt.	Mon.	Strom.	Fuller	Fuller	worm	Shel.	Ross
Old Reliable, C	3½	4,250	36x5	36x5d	Wis.	4-4½x6	Bosch	opt.	Mon.	Strom.	Fuller	Fuller	worm	Shel.	Ross
Old Reliable, D	5	5,250	36x6	40x6d	Wis.	4-5.1x5½	Bosch	opt.	Duplx.	Strom.	Univ.	Savg.	worm	Shel.	Ross
Old Reliable, K, L & M	7½	6,250	36x6	40x7d	Wauk.	4-4½x6½	Bosch	none	Wauk.	Strom.	Univ.	Savg.	chain	Shel.	Ross
Oneida, A-9	1½	2,350	36x6*	36x6*	Own	4-3½x5½	Bosch	West.	Own	Strom.	Own	Own	worm	Own	Ross
Oneida, B-9	1½	2,750	36x3½	36x6	Own	4-4x5½	Bosch	West.	Own	Strom.	Own	Own	worm	Own	Ross
Oneida C-9	2½	3,200	36x4	36x7	Own	4-4x5½	Bosch	West.	Own	Strom.	Own	Own	worm	Own	Ross
Oneida, D-9	3½	4,100	36x5	36x10	Own	4-4½x5½	Bosch	West.	Own	Strom.	Own	Own	worm	Own	Ross
Oneida, E-9	5	5,150	36x6	40x12	Own	4-4½x5½	Bosch	West.	Own	Strom.	Own	Own	worm	Timkn.	Ross
Oshkosh	2	3,750	36x6*	36x6*	H-S	4-3½x5	N.E.	N. E.	Duplx.	Zenith	B-Lipe	B-Lipe	bevel	Own	Ross
Packard, E, Size B		3,200	34x3½	34x3½d	Own	4-4⅞x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size C		3,850	34x4	34x4d	Own	4-4⅞x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size D		4,900	36x5	36x5d	Own	4-4½x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size E		4,550	36x5	40x5d	Own	4-4½x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size F		5,950	36x6	40x6d	Own	4-5x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size G		5,700	36x6	40x7d	Own	4-5x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size V		4,100	36x6	38x7	.....	-4⅞x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size X		4,650	36x6	40x8	.....	-4⅞x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Packard, E, Size Y		6,050	38x7	44x10	.....	-5x5½	Dixie	Bijur*	Own	Own	Own	Own	worm	Own	Own
Paige, 52-19	1½	2,680	34x5	38x7	Hink.	4-4x5½	Bosch	.....	Hink.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	.....
Paige, 50-18	2½	3,150	34x4	34x4d	Cont.	4-4½x5½	Bosch	none	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Jacx.
Service, 101	5	5,275	36x6	40x6d	Buda	4-4½x6	Eise.	West.*	Duplx.	Strom.	B. & B.	B-Lipe	worm	Timkn.	Ross
Shaw, M-2	¾	1,975	32x4	32x4	Cont.	4-3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Shaw, M-4	1	2,300	34x3	34x4	Cont.	4-3½x5	Bosch	.....	.....	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Signal, F	1	2,750	34x3½	36x5	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, H	1½	2,925	34x4	36x6	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, J	2½	3,275	34x4	36x8	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, M	3½	4,275	36x5	40x10	Cont.	4-4½x5½	Eise.	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Signal, R	5	5,300	36x6	40x12	Cont.	4-4½x6	Eise.	none	.....	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Southern, A	1	1,495	34x4	34x4	Buda	4-3½x5½	Delco	.....	Pierce	Zenith	B. & B.	.....	.....	.....	.....
Southern, B	1½	1,795	34x4	34x4	Cont.	4-3½x5	Delco	.....	Pierce	Zenith	B. & B.	.....	.....	.....	.....
Standard, 56	1	.....	34x3½	34x4	Cont.	4-3½x5	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 76	2½	.....	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Standard, 66	3½	.....	36x5	36x5	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Standard, 86	5	.....	36x6d	40x6d	Cont.	4-4½x5½	Eise.	none	Mon.	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Gem.
Sterling	1½	2,850	36x3½	36x5	Own	4-4x5½	Eise.	.....	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	2	3,100	36x4	36x6	Own	4x5½	Eise.	.....	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	2½	3,475	36x4	36x4d	Own	4-4½x5½	Eise.	West.	Wauk.	Ray.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sterling	3½	4,550	36x5	40x5d	Own	4-4½x6½	Eise.	West.	Wauk.	Ray.	M.&E.	Own	worm	Timkn.	Ross
Sterling, W	5	5,350	36x6	40x6d	Own	4-5x6½	Eise.	West.	Wauk.	Ray.	M.&E.	Own	worm	Timkn.	Ross
Sterling, C	5	5,600	36x6	40x5d	Own	4-5x6½	Eise.	West.	Wauk.	Ray.	M.&E.	Own	chain	Own	Ross
Sterling	7½	6,000	36x6	40x7d	Own	4-5x6½	Eise.	West.	Wauk.	Ray.	M.&E.	Own	chain	Own	Ross
Stewart	¾	1,350	32x4*	32x4*	LeR.	4-3⅛x4½	Eise.	.....	none	Zenith	B. & B.	Durston	in-g	Clark	C.A.S.
Stewart, 8	1	1,695	34x3½	34x4	Cont.	4-3½x5	Eise.	.....	Spec.	Zenith	B. & B.	Durston	in-g	Clark	Gem.
Stewart, 9	1½	2,250	34x3½	34x5	Cont.	4-3½x5	Eise.	.....	Spec.	Zenith	Fuller	Fuller	in-g	Clark	Gem.
Stewart, 7	2	2,875	34x4	34x4d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g	Clark	Ross
Stewart, 10	3½	3,895	36x5	36x5d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	Fuller	Fuller	in-g	Clark	Ross
Stoughton, B	1½	2,200	36x3½	36x5	Wauk.	4-3½x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Stoughton, D	2	2,600	36x4	36x7	Wauk.	4-4x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Stoughton, E	3	3,000	36x4	36x5d	Wauk.	4-4½x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	.....
Sullivan, F	1½	2,350	36x4	36x5	Buda	4-3½x4½	Bosch	.....	none	Strom.	.....	Covert	worm	Timkn.	Ross
Sullivan, E	2	2,975	36x4	36x7	Buda	4-4½x5½	Bosch	.....	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Sullivan, H	3½	.....	36x5	36x5d	Buda	4-4½x6	Bosch	.....	none	Strom.	B-Lipe	B-Lipe	worm	Timkn.	Ross
Super Truck 50	2½	3,200	36x4	36x8	Wis.	4-4x6	.....	Vesta	Simplx.	Zenith	Fuller	.....	worm	Shel.	Ross
Super Truck 70	3½	4,100	36x5	40x5d	Wis.	4-4½x6	.....	Vesta	Simplx.	Zenith	Fuller	.....	worm	Shel.	Ross
Super Truck 100	5	4,800	36x5	40x6d	Wis.	4-4½x6	.....	Vesta	Simplx.	Zenith	Hill	.....	worm	Shel.	Ross
Superior D	1	1,675	34x4½	34x4	Cont.	4-3½x5	Eise.	Opt.	Pierce	Strom.	Fuller	Fuller	in-g	Torbn.	C.A.S.
Superior E	2	2,600	34x4	36x6	Cont.	4-4½x5½	Eise.	Opt.	Pierce	Strom.	Fuller	Fuller	in-g	Torbn.	Ross
Texan	1½	1,525	34x4*	34x5	Lyc.	4-3½x5	Conn.	Bijur	.....	Car.	B. & B.	B-Lipe	worm	Chego.	C.A.S.
Tiffin A	1½	1,100	35x4½	35x4½*	Cont.	4-3½x5	Bosch	none	none	Scheb.	Det.	Det.	in-g	Russel	Lavn.
Tiffin GW	1½	2,530	36x3½	36x5	Cont.	4-3½x5½	Bosch	none	Pierce	Scheb.	Fuller	Fuller	worm	Shel.	Ross
Tiffin MW	2½	3,350	36x4	36x3½d	Cont.	4-4½x5½	Bosch	none	Pierce	Scheb.	Hart.	Fuller	worm	Shel.	Ross
Tiffin PW	3½	4,375	36x5	36x5d	Cont.	4-4½x5½	Bosch	West.*	Pierce	Scheb.	B. & B.	Fuller	worm	Shel.	Ross
Tiffin RW	5	5,250	36x6	40x6d	Cont.	4-4½x6	Bosch	West.	none	Scheb.	B. & B.	Covert	worm	Shel.	Ross
Tiffin SW	9	5,450	36x6	40x12	Cont.	4-4½x6	Bosch	West.*	none	Scheb.	B. & B.	Covert	worm	Shel.	Ross
Titan 2½	2½	3,400	34x4	36x4d	Buda	4-4½x5½	Eise.	none	Simplx.	Strom.	B. & B.	Cotta	in-g	Clark	Wol.
Titan, T	3½	4,400	36x5	40x5d	Buda	4-4½x6	Eise.	West.	Simplx.	Strom.	B. & B.	Cotta	in-g	Clark	Lavn.
Titan, H	6	5,400	36x6	40x6d	Buda	4-4½x6	Eise.	West.	Simplx.	Strom.	B. & B.	Cotta	in-g	Clark	Lavn.
Tower, J	1½	2,820	35x5	38x7	Cont.	4-4½x5½	Bosch	.....	.....	Zenith	.....	.....	worm	.....	Ross
Tower, H	2½	3,385	36x4	36x7	Cont.	4-4½x5½	Bosch	.....	.....	Zenith	Fuller	Fuller	worm	.....	Ross
Tower, G	3½	4,335	36x5	36x5	Cont.	4-4½x5½	Bosch	.....	.....	Zenith	Fuller	Fuller	worm	.....	Ross
Traffic	2	1,495	34x3½	34x5	Cont.	4-3½x5	Bosch	none	none	Carter	Covert	Covert	in-g	Russel	Own
Transport, 20	1	1,850	34x3	34x4	Cont.	4-3½x5	Eise.	none	Duplx.	Strom.	Fuller	Fuller	in-g.	Clark	Jack.
Transport, 30	1½	2,250	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Duplx.	Strom.	Fuller	Fuller	in-g.	Clark	Jacx.
Transport, 50	2	2,750	36x4	36x7	Cont.	4-4½x5½	Eise.	.....	Duplx.	Strom.	Fuller	Fuller	in-g.	Clark	Jacx.
Traylor, B	1	1,950	34x3½	34x5	Buda	4-3½x5½	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Traylor, C	1½	2,750	36x4	36x6	Buda	4-4x5½	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Traylor, D	2½	3,250	36x4	36x7	Buda	4-4½x5½	Split.	Spec.	Pierce	Zenith	Covert	Covert	.....	Shel.	Ross
Triangle, AA	¾	1,550	35x5	35x5	H-S	4-3½x5	N. E.	N. E.	none	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, A	1½	2,185	34x3½	34x6	Wauk.	4-3½x5½	Eise.	none	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, C	2	2,585	36x4	36x6	Wauk.	4-3½x5½	Eise.	.....	Wauk.	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Triangle, B	2½	2,850	36x7	36x7	Ruten.	4-4½x5½	Eise.	.....	Pierce	Strom.	Fuller	Fuller	in-g.	Clark	Gem.
Twin City	2	.....	36x4	36x7	Buda	4-4x5½	Bosch	.....	Simplx.	Strom.	Fuller	Fuller	in-g.	Clark	Ross
Twin City	3½	.....	36x5	40x5d	Own	4-4½x6	Bosch	.....	Own	Opt.	B. & B.	Fuller	worm	Timkn.	Ross
Ultimate	1½	.....	.....	.....	Buda	4-4½x5½	Eise.	.....	.....	Strom.	B-Lipe	B-Lipe	.....	Shel.	Ross
Union, F	2½	3,150	36x5	36x8	Wis.	4-4x6	Eise.	opt.	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
Union, H	4	3,975	36x6	36x10	Wis.	4-4½x6	Eise.	opt.	Duplx.	Scheb.	Fuller	Fuller	in-g.	Russel	Ross
United, A	1½	2,100	36x3½	36x6	Buda	4-3½x5½	Eise.	opt.	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, B	2½	2,850	36x4	36x7	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, C	3½	3,750	36x5	36x5d	Buda	4-4½x5½	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross
United, V	5	4,950	36x5	40x6d	Buda	4-4½x6	Eise.	.....	Simplx*	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Ross

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeR., LeRoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nlite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Duplx., Duplex; Cont., Continental; Mon., Monarch; Simplx, Simplex; McCan., McCanna; Rugles, Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespeare; Car., Carter; Flech., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Savg., Savage Arms; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salisbury, Ind., Industrial; Chego., Chicago-Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

Motor Age Monthly Guide to Truck Specifications—Concluded

These tables are revised and brought up to date monthly

Name and Model	Tons Capacity	Chassis Price	Front Tires	Rear Tires	Name of Engine	No. Cyl. Bore and Stroke	Ignition	Electric Lighting	Governor	Carburetor	Clutch	Gearset	Final Drive	Axle	Steering Gear
U. S., N	1½	2,250	36x3½	36x5	Cont.	4-3½x5	Eise.	opt.	none	Strom.	B-Lipe	B-Lipe	in-g.	Clark	Lavn.
U. S., N. W	1½	2,650	36x3½	36x5	Cont.	4-3½x5	Eise.	opt.	none	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
U. S., R	2½	3,850	36x4	36x4d	Own	4-4½x5½	Eise.	opt.	Own	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
U. S., S	3½	4,450	36x5	36x5d	Own	4-4½x5½	Eise.	opt.	Simplx.	Strom.	B-Lipe	B-Lipe	worm	Shel.	Lavn.
U. S., T	5	5,600	36x6	40x6d	Own	4-4½x6½	Eise.	opt.	Simplx.	Strom.	Fuller	Fuller	Opt.	.....	Ross
Victor	1½	2,050	34x4	34x5	Cont.	4-3½x5	Eise.	opt.	none	Strom.	B. & B	Durst.	in-g.	Torbn.	Ross
Velie, 46	1½	1,925	36x3½	36x5	Cont.	4-3½x5	Berl.	opt.	Mon.	Strom.	B. & B	Durst.	in-g.	Shel.	C.A.S.
Vim, 27	1	1,095	31x4	31x4	Own	4-3x4½	A-K	West.	none	Zenith	Own	Own	worm	Shel.	Gem.
Vim, 28	1	1,350	32x4½	32x4½	Own	4-3x4½	A-K	West.	none	Zenith	Own	Own	worm	Shel.	Gem.
Vim, 25	1½	2,195	35x5	35x5	Herc.	4-3½x5½	Split.	none	none	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Vim, 22	2	3,150	36x6	36x6	Herc.	4-3½x5½	Split.	none	none	Zenith	B-Lipe	B-Lipe	worm	Shel.	Gem.
Vim, 23	3	3,950	36x5	36x5d	Herc.	4-4½x5½	Split.	none	none	Zenith	B-Lipe	B-Lipe	worm	Shel.	Ross
Walker Johnson, B	2½	2,890	36x4	36x8	Buda	4-4½x5½	Eise.	none	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Walter, MO	3	.....	40x4d	40x4d	Own	4-4½x6	.....	none	Own	Zenith	Own	Own	ext-g.	Own	Ross
Walter, S	5	5,500	36x6	40x6d	Wauk.	4-4½x6½	Simms	West.	Own	Strom.	B-Lipe	Warn.	in-g.	Own	Ross
Ward La France, 2-B	2½	3,590	36x4	36x7	.....	4-4½x5½	Bosch	West.	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Ward La France, 4-A	3½	4,490	36x5	36x5d	.....	4-4½x6½	Bosch	West.	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Ward La France, 5-A	5	5,490	36x6	40x6d	.....	4-5x6½	Bosch	West.	Own	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Watson	¾	1,750	34x4½	34x4½	Wauk.	4-3½x5½	Conn.	Dyn.	Wauk.	John.	B-Lipe	B-Lipe	worm	Own	Ross
Watson	3½	.....	36x5	36x10	Cont.	4-4½x5½	Simms	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Wis.	Ross
White, 15	2	2,400	34x4½*	34x4½*	Own	4-3½x5½	.....	.....	none	Own	Own	Own	bevel	Own	Lavn
White, 20	2	3,300	36x4	36x7	Own	4-3½x5½	.....	.....	none	Own	Own	Own	d-rd	Own	Clark
White, 40	3	4,500	36x5	40x5d	Own	4-3½x5½	.....	.....	none	Own*	Own	Own	d-rd	Own	Clark
White, 45	5	5,000	36x6	40x6d	Own	4-4½x5½	.....	.....	none	Own*	Own	Own	d-rd	Own	Clark
White Hickory, E	1	2,350	35x5	35x5	Cont.	4-3½x5	Eise.	none	Simplx.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
White Hickory, H	1½	2,475	36x3½	36x5	Cont.	4-3½x5	Eise.	none	Simplx.	Strom.	Fuller	Fuller	worm	Timkn.	Ross
White Hickory, K	2½	3,075	36x4	36x7	Cont.	4-4½x5½	Eise.	none	Simplx	Strom.	Fuller	Fuller	worm	Timkn.	Lavn.
Wichita, K	1	2,900	36x3	36x4	Own	4-3½x5	.....	.....	None	Strom.	Own	Cotta.	worm	Shel.	Ross
Wichita, L	1½	2,600	36x3½	36x5	Own	4-3½x5	.....	.....	Wauk.	Strom.	Own	Cotta.	worm	Shel.	Ross
Wichita, M	2	2,800	36x3½	36x6	Own	4-3½x5½	.....	.....	Wauk.	Strom.	Own	Cotta.	worm	Shel.	Ross
Wichita, R	2½	3,000	36x4	36x7	Wauk.	4-3½x5½	.....	.....	Dupix.	Strom.	Hart.	Cotta.	worm	Shel.	Ross
Wichita, RX	2½	3,600	36x4	36x8	Beav.	4-4½x6	.....	.....	Dupix.	Strom.	Hart.	Cotta.	worm	Shel.	Ross
Wichita, O	3½	4,000	36x5	36x5d	Beav.	4-4½x6	.....	.....	Dupix.	Strom.	Hart.	Cotta.	d-rd	Shel.	Ross
Wichita, S	5	5,000	36x6	40x6d	Beav.	4-4½x6	.....	.....	Dupix.	Strom.	Hart.	Own	B-Lipe	Shel.	Gem.
Wilcox, A-1	1	.....	35x5	35x5	Buda	4-3½x5½	Bosch	none	Pierce	Strom.	B-Lipe	B-Lipe	worm	Wis.	Own
Wilcox, B	1½	.....	36x4	36x5	Own	4-4½x5	Bosch	none	Pierce	Wil-B	Own	Own	worm	Wis.	Own
Wilcox, C	2½	.....	36x4	36x3d	Own	4-4½x6	Bosch	none	Pierce	Wil-B	Own	Own	worm	Shel.	Own
Wilcox, E	3½	.....	36x5	36x5d	Buda	4-4½x5	Bosch	none	Pierce	Wil-B	Own	Own	worm	Shel.	Own
Wilcox, W	6	.....	36x5	40x6d	Wauk.	4-4½x6½	Bosch	none	Pierce	Marvel	B. & B.	B-Lipe	worm	Timkn.	Ross
Wilson, F	1½	2,650	36x3½	36x5	Cont.	4-3½x5	Eise.	opt.	Pierce	Marvel	B. & B.	B-Lipe	worm	Timkn.	Ross
Wilson, EA	2½	3,300	36x4	36x7	Cont.	4-4½x5½	Eise.	opt.	Pierce	Malvel	Warner	Warner	worm	Timkn.	Ross
Wilson, G	3½	4,300	36x5	36x5d	Cont.	4-4½x5½	Eise.	opt.	Pierce	Marvel	Warner	Warner	worm	Timkn.	Ross
Wilson, H	5	5,275	36x6	40x6d	Cont.	4-4½x5½	Eise.	opt.	Pierce	Marvel	Warner	Warner	worm	Timkn.	Ross
Winther	.....	.....	.....	.....	H-S	4-3½x5	.....	West.	.....	Strom.	.....	Warner	.....	.....	.....
Winther, 39	1½	2,325	34x3½	34x5	Wis.	4-3½x5	Eise.	Bijur.*	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn
Winther, 439	1½	2,575	32x4	32x4	Wis.	4-3½x5	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn
Winther, 49	2	.....	34x4	34x4d	Wis.	4-4 x5	Eise.	Bijur.*	.....	Mast.*	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 70	3	4,100	36x5	36x5d	Wis.	4-4½x6	Eise.	Bijur.*	.....	Mast.*	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 89	4	4,500	36x5	40x5d	Wis.	4-4½x6	Eise.	Bijur.*	Simplx	Mast.*	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 109	5	5,000	36x6	40x6d	Wis.	4-4½x5½	Eise.	Bijur.*	Simplx	Mast.*	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 129	6	5,250	36x6	40x12	Wis.	4-5x6	Eise.	Bijur.	Simplx	Mast.*	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 149	7	5,500	36x6	40x7d	Wis.	4-5x6	Eise.	.....	.....	Strom.	Fuller	Fuller	in-g.	Clark	Lavn
Winther, 450	2½	.....	34x5	34x5	Wis.	4-4½x6	Eise.	Bijur.	.....	Mast.	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 479	3½	4,900	36x5	36x5d	Wis.	4-4½x6	Eise.	Bijur.	.....	Mast.	B. & B.	B-Lipe	in-g.	Clark	Ross
Winther, 979	3½	4,250	38x7	42x9	Wis.	4-4½x6	Eise.	Bijur.	.....	Mast.	B. & B.	B-Lipe	in-g.	Clark	Ross
Witt-Will, N	1	2,100	36x3*	36x4*	Cont.	4-3½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Witt-Will, P	2½	3,150	36x3½*	36x3½d	Cont.	4-4½x5½	Eise.	.....	Pierce	Zenith	B-Lipe	B-Lipe	worm	Timkn.	Ross
Wolverine, C	1½	2,380	34x3½	34x5	Cont.	4-3½x5	Eise.	G&D*	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem.
Wolverine, D	2	2,650	34x4	34x3d	Cont.	4-3½x5	Eise.	G&D	Mon.	Strom.	Fuller	Fuller	in-g.	Russel	Gem

Abbreviations: **Engine**—Wauk., Waukesha; Cont., Continental; H-S, Herschell-Spillman; Lyc., Lycoming; N.A., North American; Herc., Hercules; Mil., Milwaukee; Wis., Wisconsin; LeF., LeFoi; GBS, Golden, Belknap & Swartz; Bea., Beaver. **Ignition**—Eise., Eisemann; A-K, Atwater Kent; Koko., Kokomo; Split., Splitdorf; Conn., Connecticut; Lau., Lauraine; Berl., Berling; A-L, Auto-Lite. **Electric Lighting**—Nite, Nicolite; G&D, Gray & Davis; A-L, Auto-Lite; Dneto., Dyneto; Al-Ch., Allis-Chalmers; West, Westinghouse; L-N, Leece Neville; Det., Detroit; N-E, North East; Wag., Wagner; Asterisk, electric starting also. **Governor**—Wauk., Waukesha; Dupl., Duplex; Cont., Continental; Mon., Monarch; Simplx, Simplex; McCan., McCanna; Rugles, Ruggles. **Carburetor**—Scheb., Schebler; Strom., Stromberg; Ray., Rayfield; King., Kingston; Mon., Monarch; Shake., Shakespare; Car., Carter; Floch., Fletcher; Holl., Holley; Ens., Ensign; Mast., Master; John., Johnson; Stew., Stewart; Till., Tillotson; Asterisk, vacuum fuel feed. **Clutch**—B.&B., Borg & Beck; B-Lipe, Brown-Lipe; Det., Detroit; Mech., Mechanics; Cover., Covert; Save., Savage Arms; Hele-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Save., Savage Arms; Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Gearset**—B.Lipe, Brown-Lipe; G-Lees, Grant-Lees; Det., Detroit; Mech., Mechanics; Cover., Covert; Save., Savage Arms; Brown-Lipe; Det., Detroit; H-Shaw, Hele-Shaw; Mech., Mechanics; M&E, Merchant & Evans; Lyc., Lycoming; W. G. Co., Warner Gear Co. **Final Drive**—in-g., internal gear; d-rd., double reduction; s-bev., spiral bevel; ext-g., external gear. **Axle**—Timkn., Timken; Torbn., Torbenson; Key-H., Keystone-Hindley; Shel., Sheldon; Salsby., Salsbury; Ind., Industrial; Chgo., Chicago Standard; Chgo., Chicago; W-W., Walker-Weiss; Emp., Empire. **Steering Gear**—Gem., Gemmer; Lavn., Lavine; Warn., Warner; Ditw., Ditweiler; Jacx., Jacox; Fost., Foster; Wol., Wohlrab. **Tires**—Asterisk, pneumatic.

When is a Ramp Desirable?

(*Concluded from page 9*)

thrown on the floor of the incline and on the side walls and still no direct light or glare to strike the eyes of the driver. It can be done in a number of ways with electric lights but is more difficult with gas or oil lamps. A, Fig. 3, shows one of the best schemes but must be installed when the walls are built. It will be seen that in this scheme there is nothing to protrude and be liable to damage while the light is down where it is wanted near the floor. Wall and ceiling brackets with reflectors, B and C, Fig. 3, are good arrangements where scheme A is out of the question but B must be high enough to escape damage.

Construction

The ramp may be built in a variety of ways mostly dependent on the building itself. If a concrete structure, the ramp should be built integrally with the building at the time of its erection. In an old building, mill construction will be found most convenient. Where turning ramps are to be made, wood is hard to handle on account of the curved and helicoidal surfaces involved while it is quite easy to strike off the surface of concrete in most any form having the proper grounds or guides in place. Fig. 2 illustrates a few methods of ramp construction and details.

RED DIAMOND MOTORS FOR ATHENS

Atlanta, Ga., Sept. 2—The Red Diamond Motors, Inc., will construct its million-dollar assembling plant at Athens, Ga., instead of at Atlanta as previously planned and actual construction work on this plant will probably be under way in the near future. Five Athens business men are included on the board of directors and for that reason it was decided to locate the company at Athens. A factory will be erected next year for the manufacture of the Red Diamond Motor which is the invention of W. H. Seabrooke and R. E. Hicks, president and vice-president of the corporation.

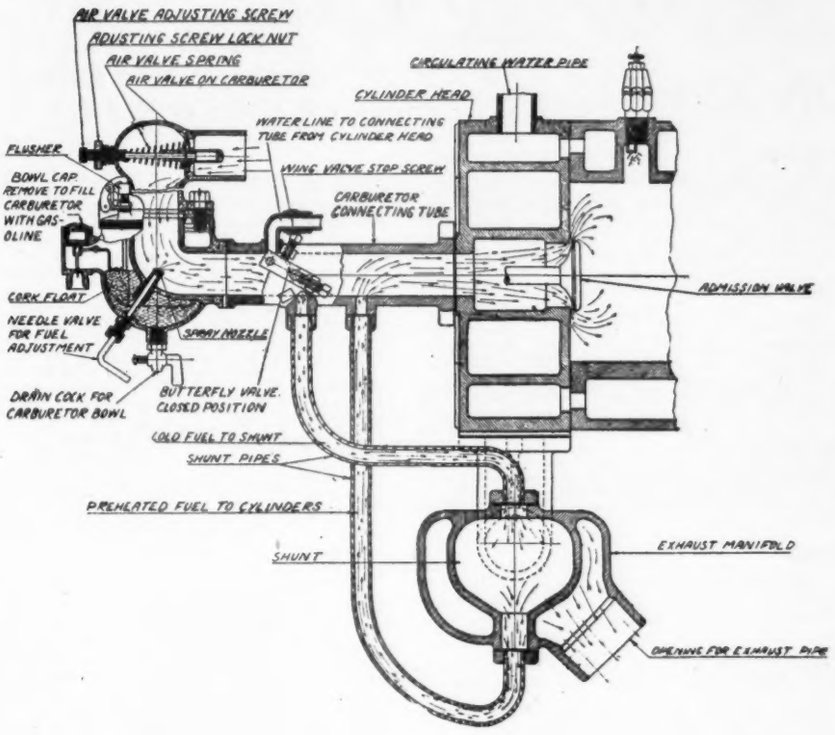
WALL PUMP LEASES PLANT

Quincy, Ill., Sept. 2.—The Wall Pump & Compressor Co., incorporated under the laws of the state of Illinois for $200,000, half common and half preferred, has leased a building here with 18,000 square feet of floor space and especially adapted for manufacturing purposes. It expects to work gradually into the manufacture of air compressors especially suitable for garage purposes and at the present time is manufacturing high vertical dry vacuum pumps for the mechanical cow milker service and a gas engine governor. The officers are G. A. Wall, president; Leaton Irwin, vice-president; Mac Irwin, secretary and G. W. Gille, treasurer.

PREMIER TIRE NEARLY READY

Beamsville, Ont., Sept. 3.—The plant of the Premier Tire & Rubber Co., Ltd., is nearing completion and the company expects to be operating about the beginning of next year. The daily output of tubes, it is estimated, will be from 400 to 1000.

Hart-Parr Tractor Has Carbureter Shunt Which Eliminates Tendency to Manifold Loading After Long Periods of Idling



ONE of the interesting features in connection with the construction of the manifolding of the Hart-Parr tractor engine, is the carbureter shunt, which is a device that when the engine is idling takes the gases through a long tube to the heated section surrounded by the exhaust gases. With this device much of the tendency toward manifold loading is eliminated, and a smoothness of operation is secured which is manifested when the throttle is suddenly opened after long idling periods.

The illustration herewith gives in detail the passage known as the shunt. It can be seen that the throttle valve when in closed position closes the direct passage through the intake valve, but in so doing the opening to the shunt passage is allowed to be open, and the gases are then forced through the shunt opening through the heated section and back into the intake manifold. During passage through the shunt the liquid particles in the fuel have become heated, vaporized and incorporated into a highly combustible mixture. As soon as the throttle valve is open, the path through the shunt passage being of higher resistance gets the least amount of flow and the quantity of gas passing through this passage is therefore negligible.

This construction, it is claimed, gives a high volumetric efficiency, because the mixture is introduced to the cylinder in the cold state.

New Paige Six a Larger Car

(Concluded from page 32)

The carbureter is a Rayfield water jacketed type fitted with hot air intake and connected to a hot-spot type intake manifold which is so arranged that the unvaporized gases are brought in contact with the lower face of the exhaust manifold to assist in vaporization.

The electrical equipment consists of Gray & Davis units for starting and lighting, and Atwater Kent for ignition. The generator is mounted on the left side of the engine and is driven off the pump shaft by means of a flexible, adjustable coupling. The starting motor is on the left side of the engine and bolts against a flange on the crankcase and is equipped with Bendix drive. The ignition units, including the distributer and coil, are mounted on a post on the front end of the crankcase, the coil being immediately adjacent to the distributer to cut down electrical losses and providing an accessible location for inspection and adjustment.

The clutch employed on this model is the same as on the previous Paige big six, being a Borg & Beck, 12 in., three plate, dry type. The three-speed gearset is also similar to the former model, being conventional three-speed and reverse type fitted with the Paige transmission lock which is integral with the cover plate and equipped with a Yale lock. The propeller shaft on the new model differs from that of the preceding six in that it is a continuous member and no longer broken in two parts as in the former model which had a trunnion joint at this point.

The front axle is drop forged I-beam section, heat treated, with Bock roller bearings for the front wheel spindles. The steering gear is a Jacox, adjustable type with an 18 in. steering wheel. The car has a turning radius of 22 ft. The fuel supply is carried in a 23 gal. gasoline tank at the rear protected by a rear cross-member. Feed to the carbureter is by Stewart vacuum system.

BODY LINES NEW

The body lines and exterior fittings are entirely new on this car. The popular straight line brought to the front end of the radiator giving a flanged hood, is employed in this new car, and cowl line being raised only slightly above the hood. This, in connection with a high, narrow radiator, gives a marked rectangular effect. The windshield is equipped with side glasses, giving an upright post for good attachment of the side curtains. The side member on the windshield is placed so far ahead that it does not result in giving a blind spot to the driver. The closed bodies have the same characteristic hood and cowl lines, the edge, however, being merged into the side lines of the body to accommodate itself to the door lines. The prices on these cars are as follows: Sedan six-66, $3995; Coupe six-66, $3895; Larchmont II, sport six-66, $3095; The Lakewood, which is a seven-passenger touring model, $2995.

If You Operate a Tire Business

(Concluded on page 13.)

sion that every dealer who lacks efficiency and system in his business is making a failure of his business, but the great danger lies in the fact that the lack of knowledge on his part of just what his business amounts to in dollars and cents places him in a position where at some time or other if he should meet with a crisis, due to any number of common causes, he would be unable to recover as he would were his business established on the solid rocks of efficiency and system.

The dealer who answers "I don't know" is unconsciously injuring himself through an ignorance of what he is actually doing in his business as well as being a weak link in the chain of American business. A dealer who finds himself in this position is not keeping himself posted on modern methods of doing business. He is allowing his affairs to float rather than swim upstream after bigger and better business.

From the Four Winds

Glimpses at the World of Motordom

COMING MOTOR EVENTS

Automobile Shows

Toronto, Exhibition City	National Automobile Show	Aug. 28-Sept. 11
Sacramento, Cal	Annual Show	Sept. 4-12
Indianapolis	Fall Automobile Show	Sept. 6-11
Cincinnati	Annual Passenger Car Show	Sept. 18-25
Memphis, Tenn	Annual Passenger and Commercial Car Show	Sept. 25-Oct. 2
Buffalo	Closed Car Show	Sept. 27-Oct. 2
Minneapolis	Closed Car Show	Oct. 5-9
Northampton, Mass	Annual Automobile Show	Oct. 6-8
Jersey City, N. J	Annual Automobile Show	Nov. 15-20
New York	Automobile Salon	Nov. 14-21
Chicago	Automotive Equipment Show	Nov. 15-20
New York	National Passenger Car Show	Jan. 8-15, 1921
Chicago	National Passenger Car Show	Jan. 29-Feb. 4, 1921
Minneapolis	Winter Show	Feb. 5-12, 1921

Tractor Shows

Peoria, Ill	National Implement and Power Farming Show	Sept. 17-26
Los Angeles, Cal	National Tractor and Implement Show of the West	Sept. 20-26
Columbus, O	National Tractor Show	Feb. 6-12, 1921

Foreign Shows

London	Commercial Vehicles, Exhibition, Olympia	October
London	Passenger Car Show, Olympia	November 4-13
Christchurch, N. Z	Olympia Motor Exhibition	Nov. 6-13
Sydney, Australia	Motor Show	Jan. 7, 1921

Races

Syracuse, N. Y	Dirt Track	Sept. 17-18
Allentown, Pa	Dirt Track	Sept. 25
Los Angeles, Cal	Speedway Race	Nov. 25

Conventions

Atlantic City	National Implement and Vehicle Assn. Twenty-seventh Annual Convention	Oct. 20, 21, 22
Cincinnati	Ohio Automobile Trade Assn. Fourth Annual Convention	Dec. 8-10
Chicago	N. A. D. A. Annual Meeting	Jan. 31-Feb. 1, '21

Getting Traction on Slippery Roads

Something new for trucks—sand box constructed so sand can be released from driver's seat by a foot pedal. This helps to get traction on wet and icy roads. Invented by Charles Wuestefeld

PERSONALS

Donald S. Michelsen, formerly general manager of the Worcester Pressed Steel Co., Worcester, Mass., has become general manager of the Globe Machine & Stamping Co., Cleveland, succeeding A. F. Shroeder, who has been general manager for almost twenty years and who will continue to hold the office of president.

D. B. Williams, who has been advertising and assistant sales manager of the American Motors Co., sales and advertising manager of the Mutual Motors Co., assistant sales manager of the Chevrolet Motors Co., at Flint, in charge of the commercial car division of the general sales department of the same company in New York and later branch manager in New Orleans, has been appointed advertising manager of the Handley-Knight Motors Co., Kalamazoo.

Joe G. Roberts, for three years general manager of the Chicago branch of the Nash Sales Co., has been given the Nash franchise at Philadelphia and is succeeded by Dan T. Vriesema, a veteran Chicago distributor.

W. G. Shultz, Sales Manager for the Sandow Motor Truck Co., sailed on July 31 on the Aquitania for an extended business trip through England, Scotland, Norway, Sweden, Denmark, Holland and Switzerland. The purpose of Mr. Shultz's trip is to develop the present foreign connections of the Sandow Motor Truck Co., which already occupies a position as one of the leading exporters of motor trucks in this country.

E. S. Foljambe, widely known throughout the automotive industry as editor of trade publications and as an official of the Society of Automotive Engineers, has joined the forces of the Goodyear Tire & Rubber Co. of California at Los Angeles, as a special representative of the motor truck tire department.

F. D. Wisdom has been put in charge of the Northwestern territory for the Moon car. Previously he was with the Moon in the Western territory with headquarters at Los Angeles.

Charles I. Ochs, assistant general manager of the Eaton Axle Co., since it was placed in charge of the axle division of the Standard Parts Co., has been promoted to general manager of the concern. His new position places him in charge of the three large units now included in the axle division.

BUSINESS NOTES

The Mesta Machine Co., Pittsburgh, has opened an office in the Singer Building, New York, from which all its foreign business will be handled. This wil aso be the saes office for the New York and Eastern states terrtory. M. M. Moore, export sales manager, will be in charge.

The general sales office of the American Malleables Co., Lancaster, N. Y., and Owosso, Mich., have been moved to Detroit. P. G. Smith, vice-president of the company, will be in charge.

The Akron Tractor & Implement Co., Akron, Ohio, has been chartered with a capital of $300,000 to manufacture and sell farm implements and various agricultural implements.

The Tate-Morrow Motor Co., has become the Buick dealers in the Asheville, N. C., territory.

Articles of incorporation have been filed in behalf of the Tractor Appliance Co., of New Holstein, Wis. It is capitalized at $50,000 and intends to manufacture appliances, implements, tools and accessories used in connection with farm tractors, motor trucks, etc.